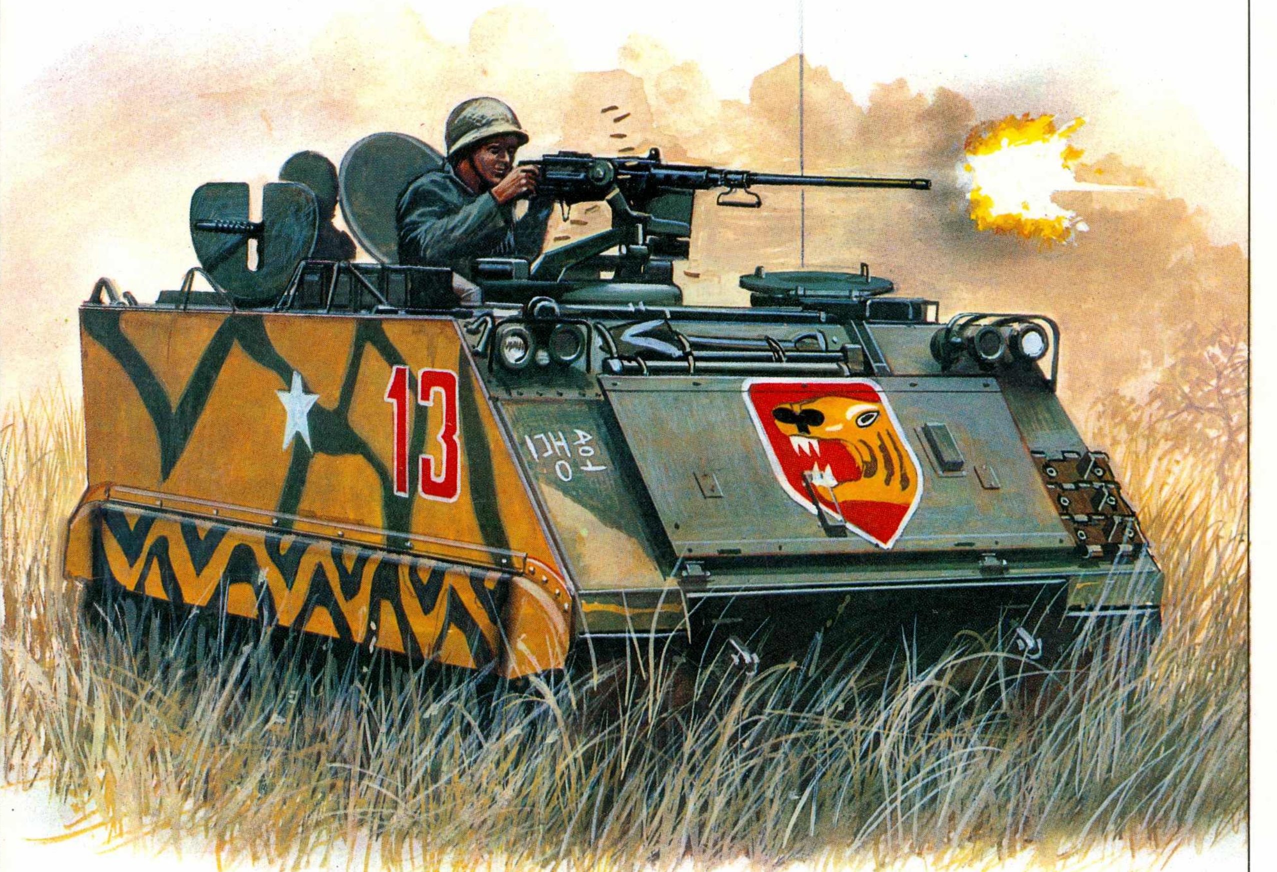
OSPREY · VANGUARD 34

THE M113 SERIES



Simon Dunstan

Colour plates by Terry Hadler and David E. Smith

VANGUARD SERIES

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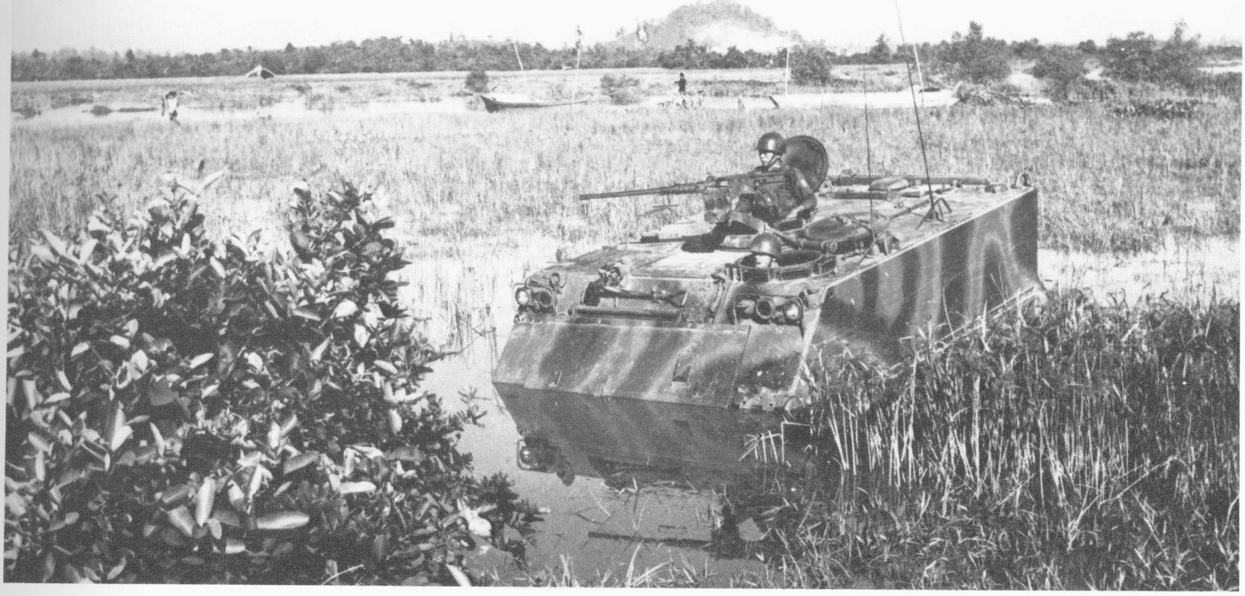


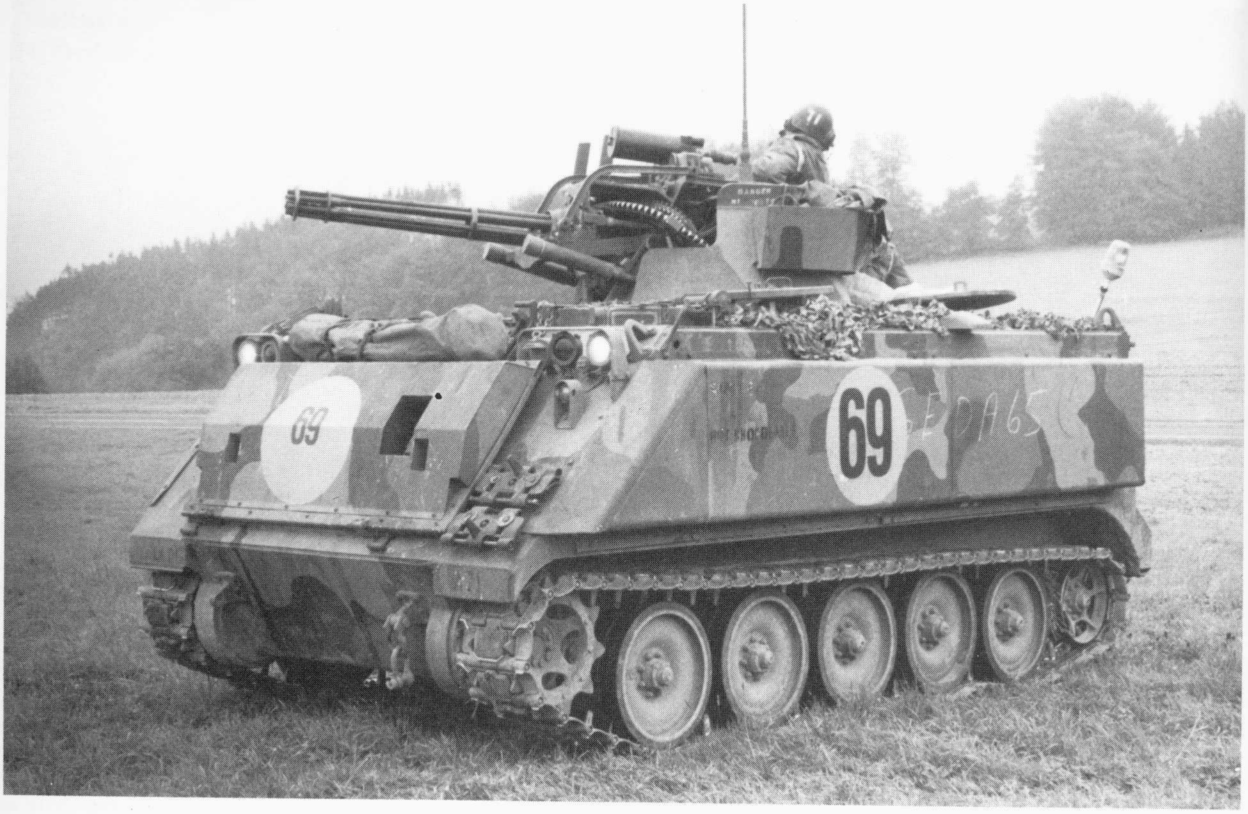
The introduction of the M113 APC into the Mekong Delta in mid-1962, together with greater numbers of helicopters, greatly enhanced the mobility of ARVN forces in the swamps and rice paddies of the region. The inherent amphibious capability of the M113 proved invaluable among the many canals and watercourses of the waterlogged terrain. (Stanley Holtom)

Introduction

Following the carnage of the Great War, innovatory military thinkers such as Col. J. F. C. Fuller and Capt. Basil Liddell Hart laid the intellectual foundations for the blitzkrieg tactics used so devastatingly by the Germans against Poland, France and the Soviet Union in the opening years of the Second World War. The essence of blitzkrieg lay in combining the shock action and mobile firepower of the tank with enhanced battlefield mobility for the infantryman, but early in the war no vehicle existed which integrated these functions to their full potentiality. The principal vehicle employed to bring troops on to the battlefield remained the vulnerable soft-skinned truck, while the armoured half-tracks used by the Germans (and later the Americans) were found to lack the cross-country mobility of tanks. This defect was mainly owing to their front wheels, which either followed the contours of the ground, slowing the vehicle down and giving the occupants a decidedly rough ride, or else bogged down in soft going and defiles. Worse, the open top of the troop compartment left its human cargo vulnerable to air-burst artillery, strafing and grenade attack — the latter a particularly dangerous threat in the street-fighting of North-West Europe during 1944-5, when the interior of the vehicle was so often exposed to attack from the upper storeys of buildings. The solution was to enable the infantry to ride into battle in a completely enclosed, armoured, fully-tracked carrier.

M75 APC

Among the first such carriers developed in the post-war years was the M75. It was of welded steel construction, powered by an air-cooled six cylinder, horizontally opposed AO-895-4 Continental gasoline engine with CD-500-4 cross-drive transmission. The M75 was capable of lifting ten infantrymen plus commander and driver with their equipment at a combat loading of 41,500lbs. The carrier was originally developed and manufactured by the International Harvester Corporation, utilising automotive and



Deployed in its primary role of air defence, an M163A1 Vulcan named HOT CHOCOLATE **protects a mechanised unit during manoeuvres in Germany, September 1978. Note the yellow 'bubble gum light' at hull rear, a mandatory warning device carried by all AFVs in Germany. (Pierre Touzin)**

suspension components of the M41 Walker Bulldog light tank. The Food Machinery and Chemical Corporation (now FMC Corporation) was subsequently brought into the programme, and 1,729 vehicles were completed before production ceased in February 1954. The staggeringly high unit cost of over $100,000, however, was instrumental in bringing the assembly lines to a halt. In 1953 a few M75 APCs were used by the US Army in the Korean War (cf. Vanguard 27, *Armour of the Korean War*). Most M75s were subsequently transferred to the Belgian Army.

M59 APC

Even while production of the M75 was in progress, FMC had promoted a smaller, lighter vehicle costing half as much as the M75, and which also met the US Army requirement for amphibious operation. Design and development began in 1951 and the vehicle was standardised in December 1953 as the M59 Armored Personnel Carrier.

The M59 was powered by two liquid-cooled commercial truck engines coupled to a hydramatic transmission mounted directly to each engine. The use of commercially available engines and transmissions considerably reduced the cost of the vehicle, but the dual engine arrangement proved problematical, with insufficient power to enable the M59 to keep up with M48 tanks across country. Production of the M59 lasted from February 1954 until 1960. Just over 4,000 were built, including a 4.2-inch mortar version, the M84.

M113 APC

A new and challenging APC project, destined to become the longest running combat vehicle programme in the world, was initiated by the Army Ordnance Tank-Automotive Command (ATAC) (now the Tank-Automotive Command TACOM) in January 1956. The requirement was 'to provide a lightweight, armored personnel carrier for armor and infantry units capable of amphibious and air-drop operation, superior cross-country mobility and adaptation to multiple functions through applications of kits and/or modifications of its superstructure', under the designation Airborne, Armored, Multi-Purpose Vehicle Family.

The preliminary concept drawings were rapidly completed and a test bed (initially called the 'universal chassis') was built at ATAC within ninety days. It was powered by an Ordnance air-cooled engine, and featured rolled aluminium plate for the hull and as ballistic protection.

The use of aluminium for an armoured vehicle was an innovation. Facilities for producing aluminium had been underutilised since the Korean War and the manufacturers, seeking other uses for their product, had submitted samples of aluminium armour to the Army for test purposes. Trials revealed that in order to have comparable ballistic protection, aluminium armour weighed as much as conventional steel armour and had to be some three times as thick. However, since aluminium is considerably more rigid than steel for the same weight of metal, many structural braces can be eliminated, which reduces the overall weight of the vehicle and the number of man-hours involved in fabrication and welding, as well as increasing internal volume because of the absence of cross-members.

The test bed gave the ATAC engineers the opportunity to resolve numerous design problems such as the welding of aluminium plates, power plant design and performance, interior arrangements and weight limitations. The favourable outcome of these experiments led to the project being put out to tender in June 1956; during September the successful contender, the Ordnance Division of FMC Corporation, was contracted to develop and fabricate pilot models of the Airborne Multi-Purpose Vehicle Family.

Under this programme two distinct vehicle configurations were pursued. Five prototypes (T113) were constructed of aluminium armour and powered by air-cooled engines, and five of steel armour (T117) and powered by liquid-cooled engines. One each of the T113 and T117 ballistic hulls were manufactured and delivered to ATAC in 1957.

During this period many design alternatives were tried and tested using steel armour, aluminium armour, air-cooled engines, water-cooled engines, commercial transmissions and Ordnance transmissions—when problems were encountered, other solutions were immediately sought, and the most promising designs and components were developed and evaluated through intensive hardware testing by FMC and ATAC.

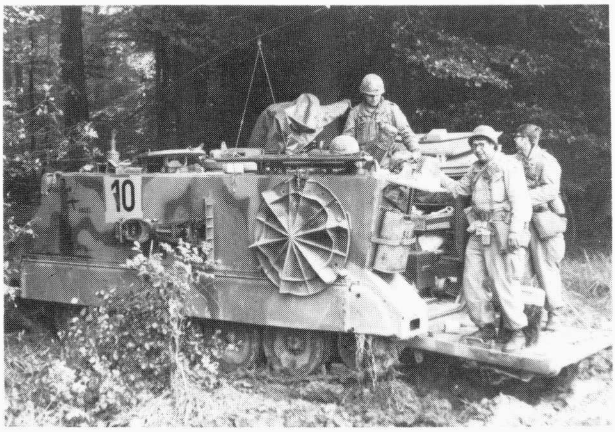
Working in collaboration with Kaiser Aluminium and Chemical Corporation and using advanced welding techniques, FMC constructed the T113 with a combination of an aluminium hull and a Continental air-cooled engine providing the lightest weight configuration with superior ballistic protection. The more conventional steel hull design and Packard water-cooled engine was also built, since this evolved from the M59 APC and presented a low-risk option. The steering transmission used for both types was the Allison XTG-90 unit.

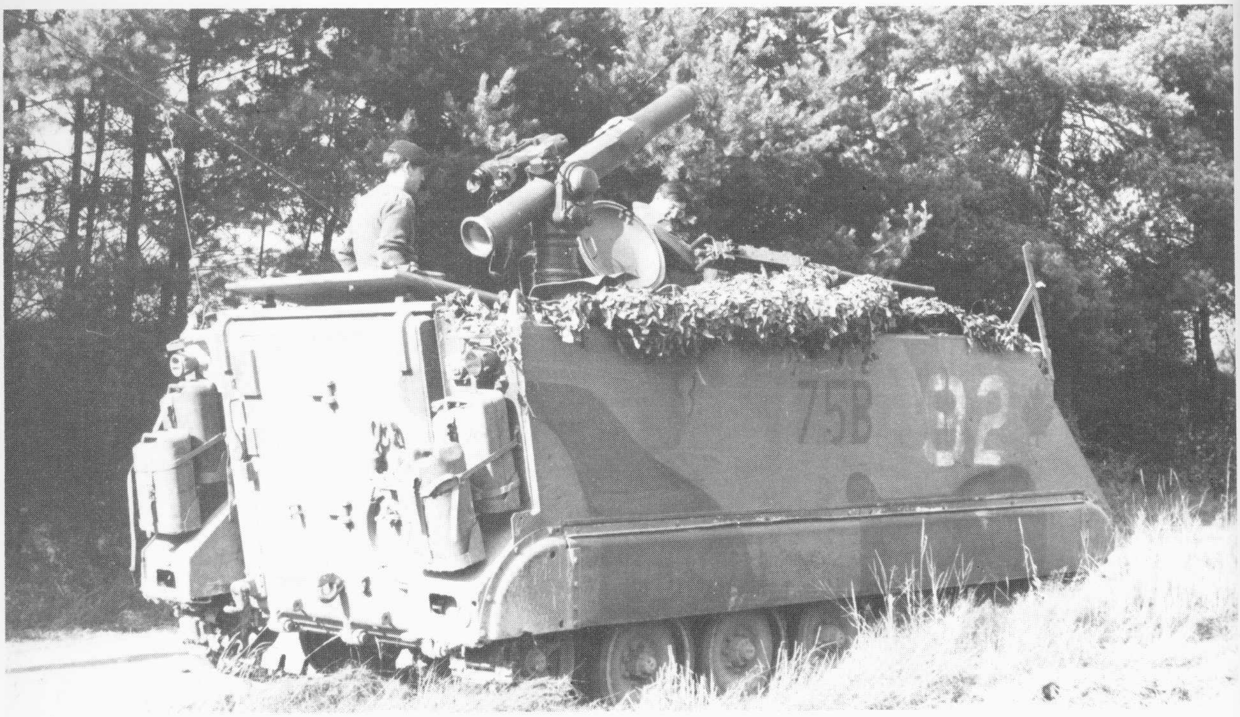
During testing it was determined that the Packard engine was less suitable for this application than other available commercial engines, so the Ford 368 UC engine was adopted at an early development stage.

Other problems were encountered at this time. Cooling difficulties were experienced with the water-cooled Ford engine which required increased engine compartment cooling capacity. On the other hand the air-cooled Continental engine did not perform as well as expected. The 12in. track originally developed for the vehicle exhibited limited durability.

After trials it was found that the aluminium hull construction gave superior ballistic protection

An M106A1 107mm Mortar Carrier named GUARDIAN ANGEL **prepares for a fire mission. In the present tactical context, the M106 fires predominantly smoke and illuminating rounds. On the hull side is the base plate and ground mount for the M30 mortar. (Pierre Touzin)**





An M113A1 APC with M220 TOW launcher of the Canadian Forces in Germany halts during a tactical exercise, September 1979. The mounting of the Tube-launched Optically-tracked Wire-guided (TOW) missile atop carriers in this manner exposes the gunner throughout the firing sequence. For this reason, TOW carriers have been superseded by the M901 ITV in the US Army. Note the subdued maple leaf marking on the forward hull side, the wire cutter at the front, and the folding M2HB Browning mount. (Pierre Touzin)

and was the most durable and cost effective from a manufacturing standpoint. As a result of the lessons learned from the first group of prototypes, FMC developed two new types of prototypes in late 1957, which were designated T113E1 and T113E2. These were described as 'austerity' vehicles because in addition to correcting the shortcomings found in the previous prototypes, they were designed to keep cost to an absolute minimum. To accomplish this, a decision was taken to adopt less expensive commercially available engines and transmissions which were in large scale production and would be available in the future. The Chrysler A710B (75M in its militarised form) was chosen because it offered the desired performance with suitable cooling characteristics and would be in production for years to come. The Allison TX-200 transmission was adopted since it was readily available and had performed well in the truck industry. The only new assembly to be developed was the controlled differential, and this was believed to be of minimal risk since most of the components in this design were modelled after a larger but similar unit that was used in the M59 APC.

Although there was a maximum weight limitation for the T113, two different hulls were developed which looked identical externally but differed in armour thickness and overall weight. The purpose of building them was to determine, through testing, data on performance and durability so that the Army could make a final decision on hull configuration based on actual test results. For these prototypes, a wider 15in. track was developed to improve both reliability and performance over the original 12in. type.

Four T113E1 and four T113E2 vehicles and a ballistic hull of each were produced. After successful testing, the heavier T113E2 was selected for production as the basis for the M113 Armored Personnel Carrier. Three pre-production pilots of the final design for the M113 were constructed and tested in 1959 to prove production tooling and manufacturing techniques. The first production M113 APC rolled off the FMC assembly lines at San Jose, California in June 1960, only three years and eight months after the award of the initial development contract. The first US Army order was for 900 vehicles.

Technical Description

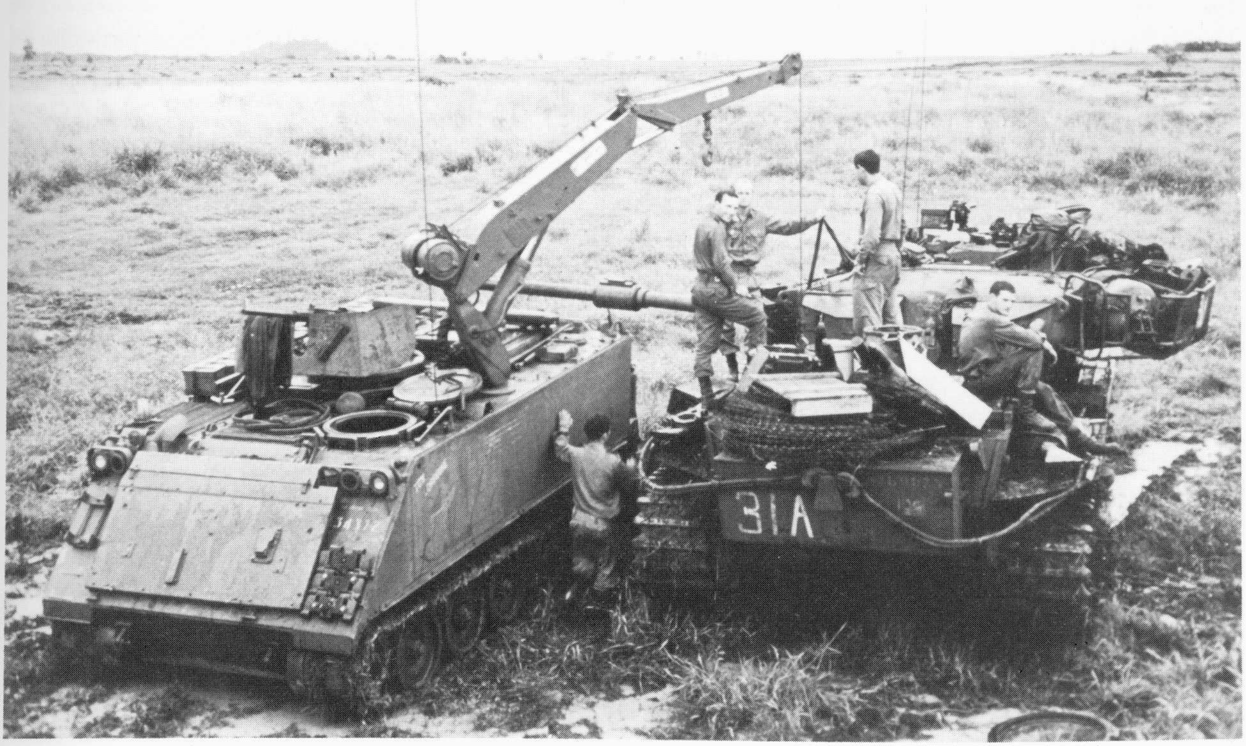
Carrier, Personnel, Full-Tracked, Armored, M113:

The M113 Armored Personnel Carrier is a fully tracked vehicle designed to transport a squad of infantry and their equipment. The engine is located at the front of the vehicle to the right of the driver. Alongside the engine and connected to it by a transfer case is an automatic hydro-kinetic torque converter transmission facing rearwards. It is coupled through a universally jointed shaft to the steering mechanism located in front of the engine, from which power is transmitted to the final drive gears and sprockets at the front of the vehicle.

The M113 is powered by a Chrysler V-8 75M water-cooled gasoline engine developing 209bhp at 4,000rpm. After production was initiated, FMC was requested to develop a diesel engine configuration that could be adapted to the production M113 engine compartment. This would provide increased performance, greater fuel economy, and would meet the Army requirement for standardisation on one type of fuel for heavy military vehicles.

The government contract required that FMC design and build prototype vehicles using the Detroit Diesel 6V53 diesel engine. Since it weighed considerably more than the gasoline engine it replaced, the government directed the use of the Allison XTG-90 transmission which was lighter than the M113 power train. However, after intensive study FMC proposed that a power train utilising the M113-type steering differential with the TX100 commercial transmission would be more reliable and less expensive than the Ordnance type XTG-90.

The government held firm to its position that the XTG-90 was the only acceptable approach, and directed that prototypes be built to that configuration. FMC, on the other hand, felt so strongly that the commercial TX100 was the best solution that FMC supplied, at its own expense, a prototype vehicle utilising the FMC-suggested power train for government testing. Comparative



One important derivative of the M113 that has not been adopted by the US Army is the Fitter's Vehicle, which is designed to undertake light repairs and component changes in the field by means of its HIAB hydraulic crane and winch. The Fitter's Vehicle is in service with several armies, notably Israel and Australia. JOY LORRAINE, **a 'Fitter's Track' of C Squadron, 1st Armoured Regiment, RAAC, replaces the auxiliary charging set engine of a Centurion Mark 5/1 (AUST) in Phuoc Tuy Province, South Vietnam, 1968. (Peter de Jong)**

An M806A1 Armoured Recovery Vehicle (Light) of the Technical Support Troop, 1/15 Royal New South Wales Lancers passes the review stand during the parade to mark the Silver Jubilee of HM Queen Elizabeth II in Sydney, 3 October 1977. (Paul Handel)

tests soon demonstrated that there were serious technical problems with the XTG-90 transmission that would require extensive reworking. Based on the results of the tests and an economic analysis that showed the latter to be far more expensive, the US Army Staff selected the FMC proposal, thus saving the US government millions of dollars. The diesel-powered vehicle designated M113A1 entered production in 1964.

The 6V53 water-cooled two-stroke compression-ignition engine is one of a series based on a common cylinder size produced by the Detroit Diesel Engine Division of the General Motors Corporation, and develops 215bhp at 2,800rpm. Both the gasoline and diesel engines are readily accessible via a large hinged door in the front hull plate behind the trim vane. The top cover may also be raised, allowing easy removal of the whole engine-transmission assembly.

The two engines demand somewhat different transmissions which are of the 'Torqmatic' heavy-duty truck type produced by the Allison Division of GMC. The M113 is fitted with the Allison TX200-2A transmission. This consists of a single-stage torque converter and an epicyclic gearbox giving six forward speeds and one reverse. The driver of the vehicle does not, however, select individual gears but is provided with a shift lever which enables him to select reverse, neutral or one of four ranges of forward gear ratios. The four ranges cover respectively the first and second gears, third and fourth gears, third, fourth and fifth gears and third, fourth, fifth and sixth gears; the 1-2 range would normally be used for climbing steep grades and the 3-4-5-6 for normal driving. Up and down gear changes within each range are automatic; they are determined by engine speed and accelerator pedal position, making the vehicle easy to drive even in rough terrain.

The M113A1 is fitted with the Allison TX100-1 transmission, which is basically similar but has only three forward speeds giving, nevertheless, four ranges of forward gears: 1, 1-2, 1-2-3, and 2-3. In both systems the hydro-kinetic torque converter is automatically locked up at certain engine speeds by means of a clutch.

The steering mechanism, which is manufactured by FMC, is the same on all vehicles of the M113 series. Designated Model DS200, it is of the Cletrac single-speed geared-differential type with band brakes. The band brakes are connected mechanically to steering levers in the driver's compartment and are used not only to steer the vehicle but also for braking. On the M113A1 each differential output half-shaft has attached to it a brake disc; the associated brake calipers being connected hydraulically to short levers in the driver's compartment. The disc brakes are intended for manoeuvring in confined spaces and they also improve the response of the vehicle when afloat.

From the steering mechanism the drive is taken to final drive units, on either side of the vehicle, and then on to the double track drive sprockets and so to the tracks.

The tracks have a pitch of six inches and are 15in. wide. Their shoes are rubber-backed with removable rubber road pads and are joined by single rubber-bushed pins, providing good road-holding and reduced noise levels. Because the road wheels are sprung by transversely located torsion bars and have to be staggered on one side of the vehicle in relation to the other, the two tracks are of slightly different length: the right-hand track consists of 64 shoes but the left has 63.

There are five dual road wheels on each side. They have a diameter of 24in. and consist of aluminium discs with solid rubber tyres $2\frac{1}{8}$in. wide. Each wheel is located by means of a trailing arm and sprung by a single torsion bar. The front and rear road wheel arms are fitted with hydraulic dampers. Hydraulically operated track adjusters are connected to the idlers to maintain track tension. Track life commonly exceeds the 3,000-mile specification originally laid down and on occasions has even attained 9,000.

The all-welded hull of the M113 is made of an alloy (type 5083) containing, in addition to aluminium, manganese and magnesium, which is produced by cold rolling. Armour thickness varies from $\frac{3}{4}$in. to a maximum of $1\frac{1}{4}$in., providing protection to the occupants from shell fragments and small-arms fire. The driver sits in the front left-hand corner of the vehicle and has a single-piece hatch with four periscopes which opens to the rear. The commander is situated in the centre of the vehicle and has a simple cupola fitted with five episcopes. Behind the commander's position is the cargo hatch above the troop compartment. Ten infantrymen ride in the rear of the vehicle on benches facing inwards. If personnel are not carried the seats can be folded, giving 231 cubic feet of cargo space. There is a hydraulic ramp at the rear incorporating a separate door and operated by the driver.

The M113 is fully amphibious without preparation beyond the raising of the trim vane at the front to stabilise the vehicle during operation in water. The M113 is propelled in water by its tracks at a speed of approximately 3mph. The rubber track shroud on each side of the hull enhances performance in water. Two electric bilge pumps are fitted to discharge water shipped whilst wading, one at the left front and the other at right rear.

The standard armament of the M113 is a flexible .50cal. M2HB Browning mounted at the commander's cupola. The weapon is belt-fed from boxes of 100 rounds and has an elevation of +53°, a depression of −21° and 360° of traverse.

ACAV

(Armored Cavalry Assault Vehicle)

The M113 first saw combat in 1962 with the Army of the Republic of Vietnam (ARVN). In March of that year a consignment of 32 M113 APCs destined for Europe was diverted to South Vietnam to aid the hard-pressed ARVN forces against the Communist insurgency.

Two mechanised companies, each with 15 APCs, were organised and they began operations against the Vietcong in the Mekong Delta during June. After some initial problems in developing the most effective means for their employment, the

Gunners of the Royal Artillery prepare an MGM52C Lance missile for firing from an M752—the launcher vehicle of the M667 Lance Missile Carrier system. (Simon Dunstan)

APCs proved highly successful. The bald statistics representing the number of VC killed and captured were considerable, and the psychological shock effect of the M113 in areas where the ARVN had not previously operated was clearly significant.

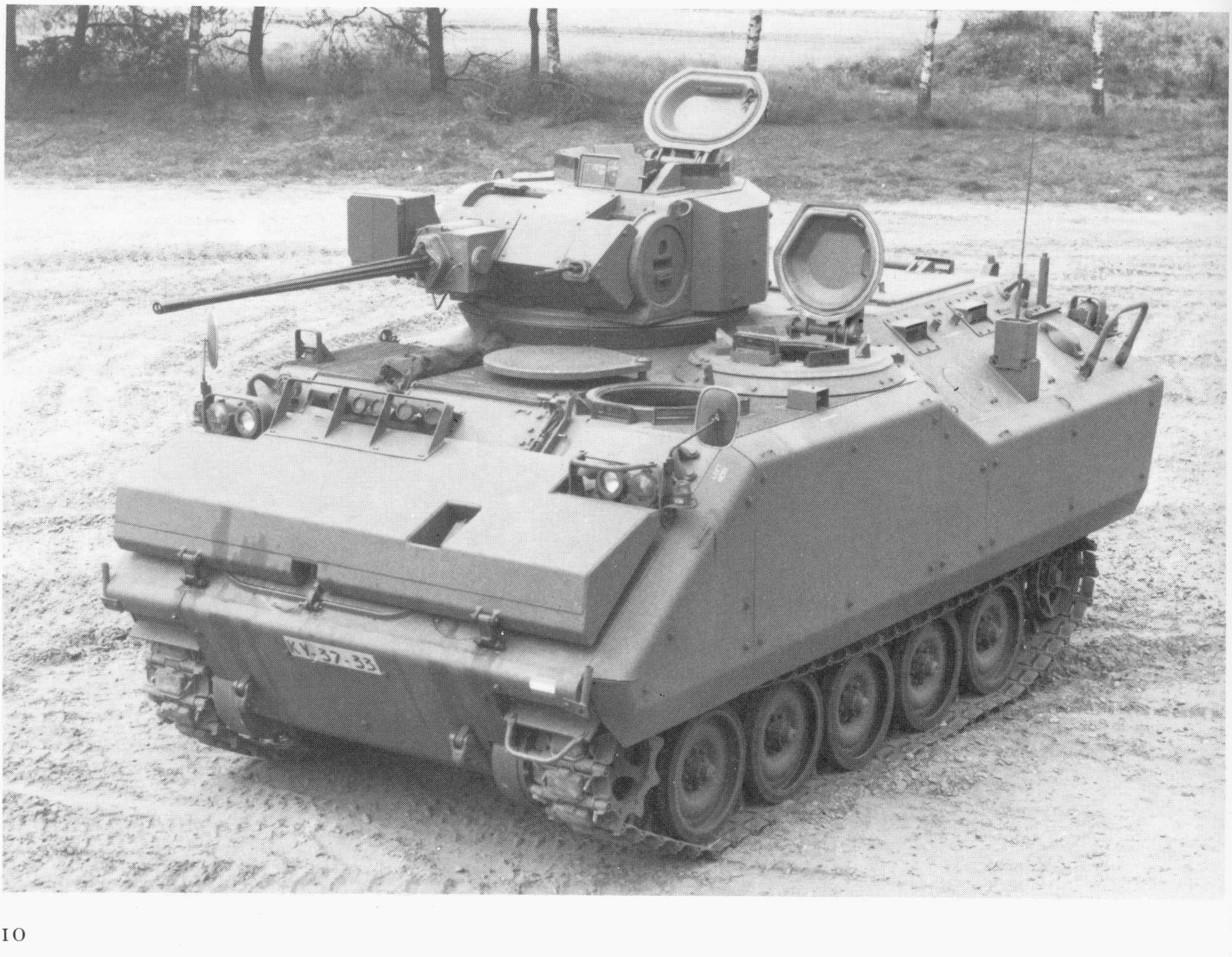
Operational experience soon showed, however, that it was not practical to dismount the infantry from an APC until VC positions had been completely overrun. Once the troops dismounted in the water-covered rice paddies much of their advantage in mobility over the VC was lost, whereas the M113 was capable of a sustained speed of 20kph across such terrain.

By these means, constant pressure could be maintained against retreating VC forces, while the .50cal. machine gun was employed to engage and hold the enemy at long range to deter retaliation from RPG teams. To ensure an uninterrupted flow of fire, the gunner dropped the free end of the ammunition belt through his cupola while the first box was being fired. Down below a crew member linked on a new belt and fed it up to the gun. This permitted the gunner to fire without having to change ammunition boxes and reload after every 100 rounds.

Meanwhile other crew members generated further firepower from the open troop compartment hatch, while keeping constant vigil for VC attempting to hide in the water by using hollow reeds as breathing tubes. Any who were spotted were either killed by grenades or crushed in place by the M113s.

Such employment, which was contrary to the contemporary doctrine that emphasised the APC as a means of transporting infantry to the battlefield, met with disfavour among the upper echelons of MACV (Military Assistance Command Vietnam); but despite their protests, the concept

A YPR-765 (Armored Infantry Fighting Vehicle) of the Netherlands Army with 25mm Oerlikon KBA cannon and spaced laminate armour on hull and turret sides, rear hull and lower front hull—the combination of these features provides a considerable increase in firepower and protection over the standard M113A1 APC, while enjoying a high degree of commonality with the latter for ease of logistical support. (Royal Netherlands Army)

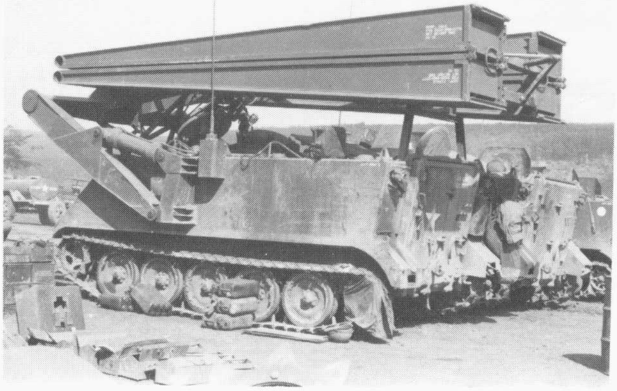


of mounted combat became widespread and was readily adopted by American units when they arrived 'in-country'.

The mobility conferred by the M113 to government forces in formerly inaccessible areas of the Mekong Delta and elsewhere was dramatic, although terrain trafficability remained a constant problem. Certain areas did not lend themselves to M113 operations, such as sugar cane and coconut plantations or areas close to rivers and canal banks. The latter type of terrain contained soft, glutinous mud which would not support an M113, causing it to flounder. Rice fields which did not contain water in the rainy season indicated that the foundation was very soft and thus to be avoided. In the dry season, although trafficability was better across rice fields, the overall speed was reduced by the time taken to traverse sun-hardened dikes which, at times, could only be negotiated through the use of explosive charges or ramps. The same dikes could be crushed during the rainy season without losing momentum. Momentum was the key factor in maintaining M113 movement across swampland or flooded rice paddies, as any involuntary halts could result in floundering. As French armour personnel had learned many years before, water buffalo were a good indicator of terrain trafficability. Generally, those areas where the water buffalo eat were safe for M113 movement, but where buffaloes sank to their bellies the terrain was too soft for the M113.

In this way the cross-country mobility of the M113 APC and the paucity of enemy anti-tank weapons made it possible to employ the APC as a fighting vehicle. American units rapidly developed the concept, and to improve fighting capabilities M113 APCs were fitted with a variety of devices, including gunshields for the .50cal. machine guns, side-mounted M60 machine guns, and sandbags or other improvised armour arranged as parapets around the troop compartment so that infantry could fire over the sides.

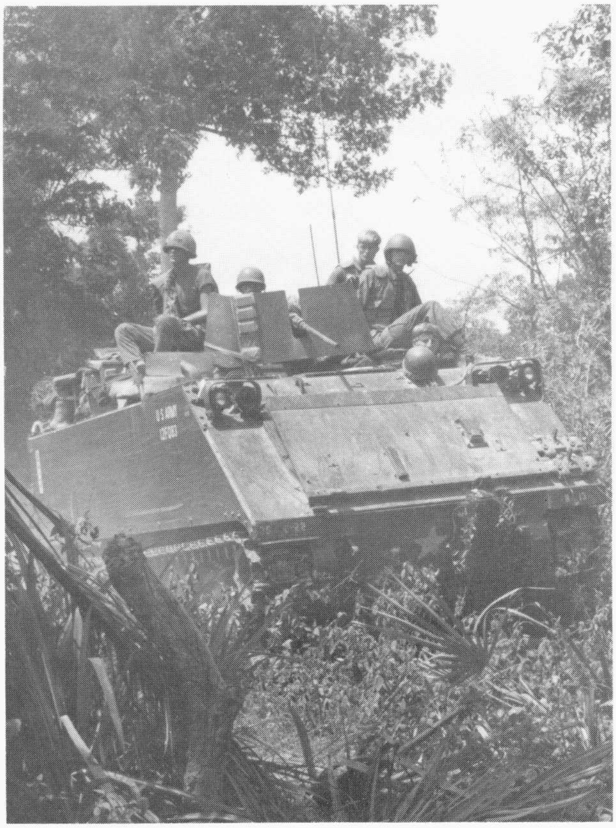
Such modifications were haphazard at first and entirely dependent on individual units; but when 11th Armored Cavalry Regiment arrived in 1966, the largest US armour formation to be deployed to Vietnam, its M113s were fitted with an armament sub-system devised by FMC. The 'A' model or kit comprised a gunshield for the .50cal. Browning and hatch armour around the commander's position providing all-round protection, and two side-mounted M60 machine guns also with gunshields. In this configuration the M113 was designated Armored Cavalry Assault Vehicle or ACAV, a term originated by Lt.Col. Martin D. Howell, commander of 1st Squadron, 11 ACR. A 'B' model or kit, consisting of hatch armour and gunshield for the commander's .50cal. Browning only, was used by mortar carriers.



To aid mobility in crossing the many steep-sided ditches, gullies and watercourses in Vietnam, US Army Engineers devised a hydraulically-operated scissors bridge mounted on an M113A1 APC in 1967. The bridge can be unfolded in two minutes without exposure of the two-man crew, and provides a gap crossing capability of 33ft. for a 15-ton vehicle. This M113A1 Marginal Terrain Assault Bridge served with 11th Armored Cavalry Regiment at Phouc Loi in 1969. (John Graber)

Many M113 APCs in mechanised infantry units were also modified with 'A' or 'B' kits and, although they were all intents and purposes identical to ACAVs and were often employed in the same role, the term ACAV was only correctly applied to those vehicles used by cavalry units.

The ACAV itself underwent many modifications. All seats except the driver's were removed to make room for ammunition cans stacked in two-deep layers, wall-to-wall on the floor of the troop compartment. Together with crew kit bags, water jerrycans, cartons of combat rations, the essential beer cooler, spare gun barrels, M79 grenade launchers and ammunition, crew weapons, boxes of demolition charges and hand grenades, hammocks, tool box and tow cables, this stowage meant that space was at a premium.

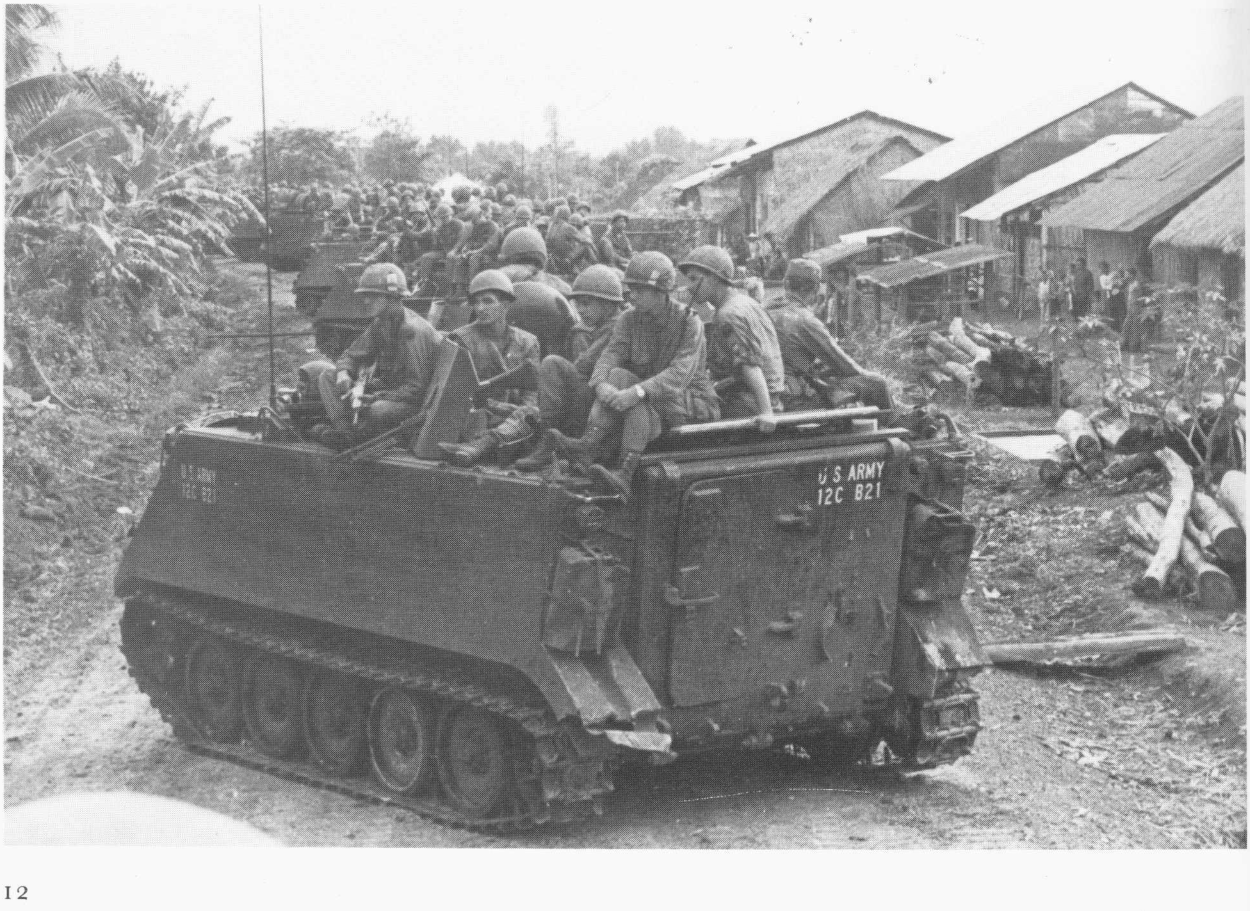


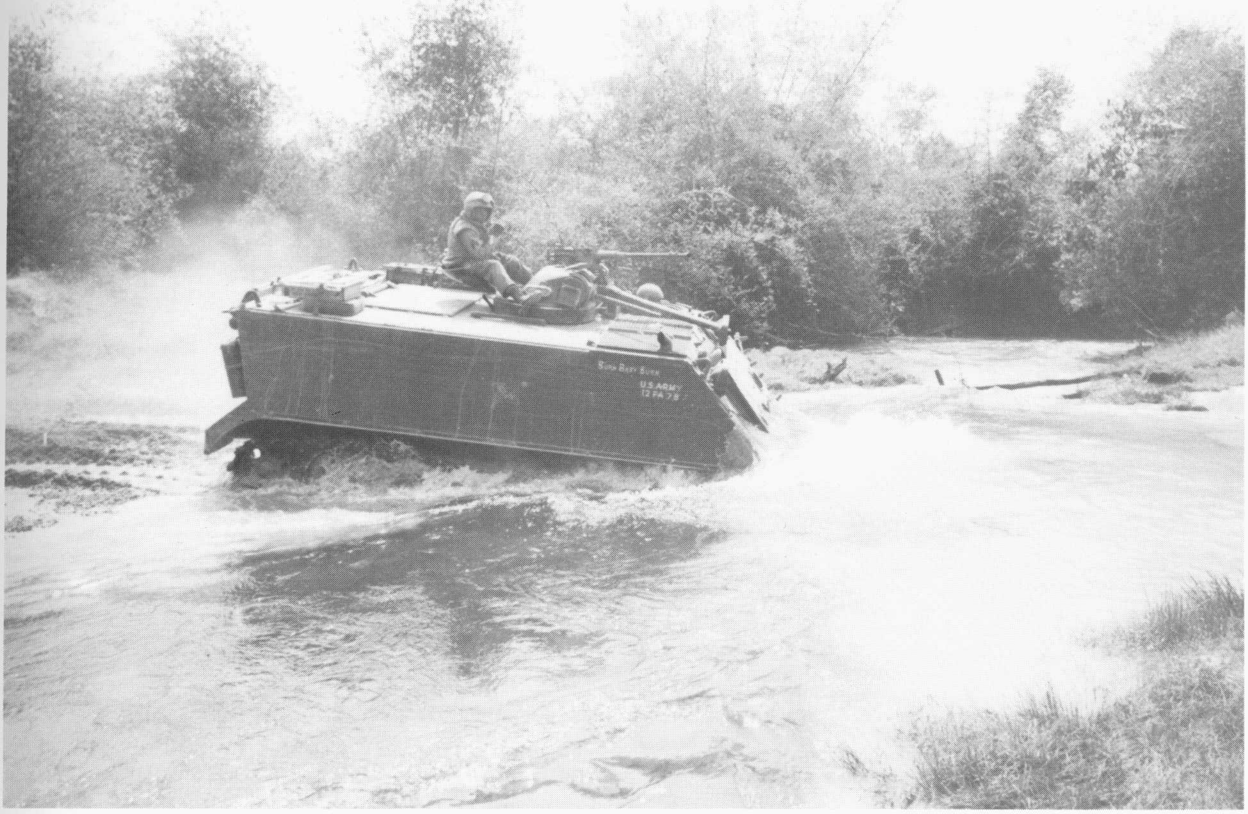
Track shrouds were removed to prevent the build-up of mud and debris underneath. In most units the floor of the driver's and troop compartments was laid with sandbags to reduce mine damage and personnel casualties. To minimise further the threat of mines, ACAVs were fitted with 'belly armor' of titanium plates beneath the hull and sponsons.

The M113 and the associated ACAV proved to be the most effective armoured fighting vehicle of the Vietnam War. The M113 was in the forefront of innumerable battles in that vicious conflict, as this account by William Kestell, a veteran of 4/23rd Infantry (Mechanized), 25th Infantry Division, relates:

Infantrymen of 25th Infantry Division scan the treeline as an M113A1 APC of 2nd Battalion, 22nd Infantry (Mechanized) forges through dense undergrowth in the Dog's Head area during the incursion into Cambodia, June 1970. Note the bumper number 'B13' is repeated on a strip down the rear hull side. (Armor Magazine)

A graphic illustration of mounted combat: ACAVs of 'The Blackhorse Regiment' deploy in 'herringbone formation' during a search-and-clear mission in Vietnam, 1967. This tactic allowed a great volume of fire to be delivered to either roadside in order to counter ambushes. (Armor Magazine)





An M132A1 Flamethrower of 1st Squadron, 11 ACR, fords a stream during Operation 'Atlas Wedge', 1969. The M132 was an M113 APC fitted with a cupola mounting an M10-8 flame gun and co-axial M73 machine gun—this vehicle, BURN BABY BURN, has a supplementary M2HB Browning on the cupola roof. (Tim Page)

'On the morning of 25 March 1968—the day before my 23rd birthday—I found myself on Highway 1 on a road-clearing operation with 2nd Section, Recon Platoon, HHC 4/23rd Infantry (Mechanized) of the 25th Division. We were heading out from Cu Chi, north to Trang Bang. It was our turn as point vehicle, but that was nothing to get excited about. Other operations like this had been milk runs. We'd get to Trang Bang before 1200 hours, and would lay over there until recalled to Cu Chi, or until a convoy came along, in which case we'd join it for the run up to Tay Ninh.

'I had arrived in Vietnam in January and was first assigned as an M60 gunner on No. 38, "The Ugly American".[1] Jeff, her regular driver, was due for R&R so, after a few weeks, he began breaking me in as relief driver. I liked being a gunner, but I knew I'd be a driver until a better assignment came along; besides, I wouldn't have to walk so much. When Jeff got back I was transferred to No. 33, "Mellow Yellow".

"Mellow" was an old M113A1 armored personnel carrier, and nobody knew how she got her name. It wasn't what I would have called her, but I thought it was bad luck to change a name. It just isn't done. She had all sorts of little quirks, like spraying diesel fuel into the driver's compartment and using a couple of gallons of water a day. Maintenance had given up trying to find the leak. We had just given her new suspension, road wheels, drive and idler sprockets, so she would now do 50-plus without a fuss. I simply got used to the little things and planned around them.

'Our section that day consisted of four APCs, each with a crew of four: TC (track commander), driver, M60 gunner and rifleman. Old No. 33 and one of the other APCs had replaced the rifleman with a 90mm recoilless for added punch. A detachment of engineers operated with us, bringing an articulated scraper and a couple of dump trucks full of gravel to fill in any road damage we might find. We were 19 men in all.

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[1] See colour plate B1.

'We were about a mile or two south of Trang Bang when a call came over the radio. An American infantry company had come upon an enemy force of unknown size, and was chasing it. Our section leader made a fast check and found that we were in a perfect position to act as a blocking force when they broke from the woodline about 300-plus metres away. Between the jungle and the road was nothing but open paddy area, a beautiful killing zone with little or no cover. When the NVA hit that paddy, it would be a slaughter.

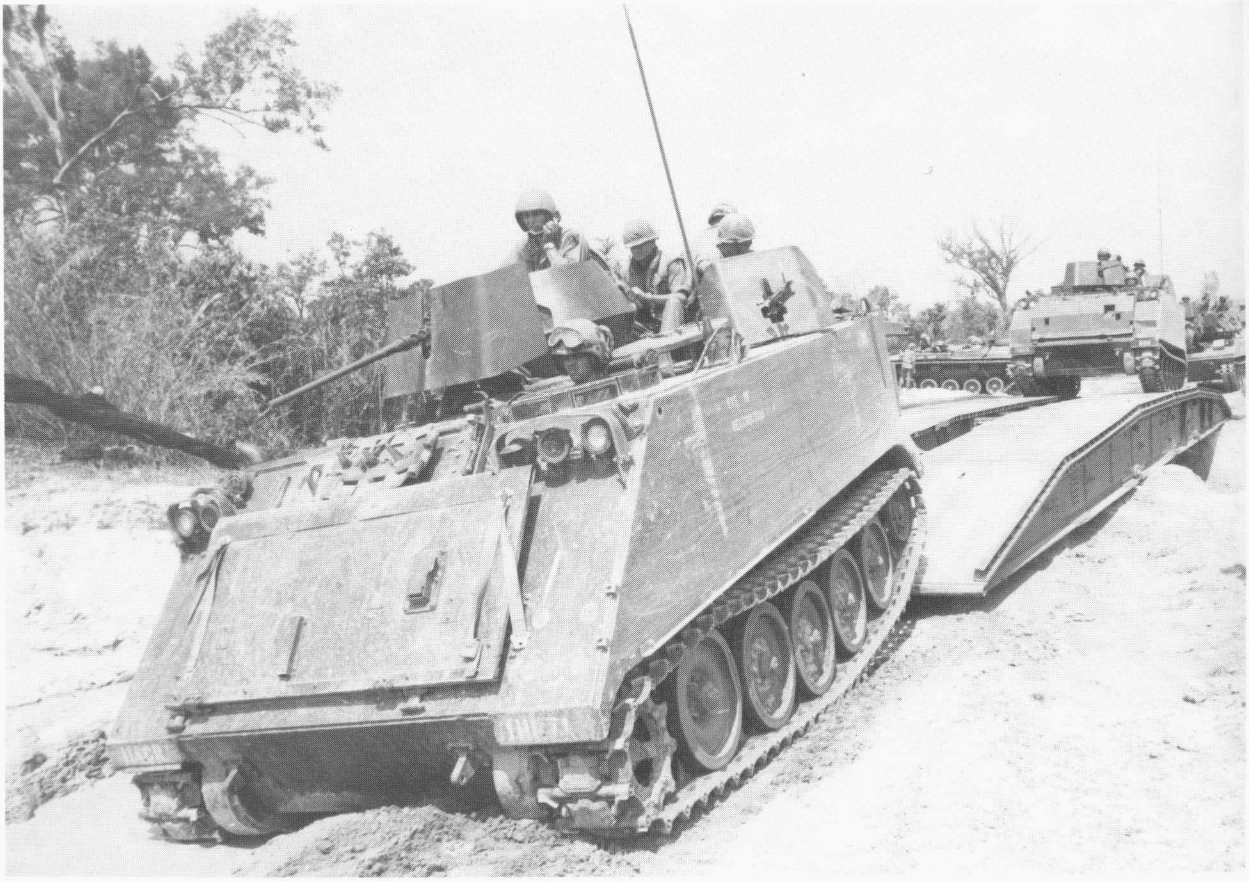
'With four .50cals., four M60s, four M79s, two 90mms, our riflemen and the engineers, we could easily blunt any movement across that stretch of ground. We got the order to halt, and the drivers pivoted the APCs 45 degrees right to a head-on position toward the expected enemy breakout point. Everyone except TCs and drivers dismounted and took up positions in the ditch in front of the vehicles.

'Larry, who was M60 gunner, took two boxes of ammo with him, and we tossed over three or four more just for good measure, giving him about 1,000 rounds. Lloyd had plenty of rounds for his 90mm—about 12 to 15 of HE [high explosive] and Beehive mixed. The excitement mounted.

'I went aft and brought up a few more boxes of .50cal. so it would be handy, positioned my M79 and my ready rounds, and got in position as Dave swung the .50 out toward the jungle. All we could do now was wait.

'At the edge of the woodline! Everyone tensed.

'Then someone shouted, "Wait! Hold it! They're ARVNs!" It was a squad-sized unit, maybe a bit larger, moving out of the woodline, heading south-west. They were probably running



EVE OF DESTRUCTION **an ACAV of 1st Squadron, 11ACR negotiates an Armored Vehicle Launched Bridge (AVLB) during a search-and-destroy mission near the Michelin Rubber Plantation, Vietnam, 1969. The FMC ACAV kit comprises a gunshield for the .50cal. Browning; hatch armour known as 'the bathtub' surrounding the commander; and gunshields for the side-mounted M60 machine guns. The second ACAV has floatation cells fitted to the trim vane and hull front to compensate for the extra weight of the 'belly armor' which was added to M113 APCs and ACAVs in Vietnam from 1969 as increased protection against mines. (Tim Page)**

An infantry squad form a 'skirmishing line' after dismounting from an M113 following the doctrine for which the M113 APC was designed, whereby infantry assault an objective on foot, having been transported to the battlefield by APC. The M113 entered service with the US Army in 1960 and will continue to serve into the 1990s. (US Army SC587504)

ahead of the enemy, frequently the case with ARVNs. We waited and held our fire.

'There they are. NVA! The .50s on all four APCs let go almost in one voice, but you could tell each TC by his special "signature", like a wireless operator. Howie on No. 38 fired his usual short-spaced, two-round bursts; Dave favored three-round groups. The 60s joined in, firing long bursts. I heard Lloyd fire, laying an HE round at the edge of the woodline.

'I saw more and more NVA break out and I began putting out HE rounds. I fired only a couple before I noticed that Dave had nearly gone through the first box of rounds. I got another box ready to go. We had practiced doing this fast so, just as he was running the last rounds through the gun, I had the next box ready. The feed cover went up as I tossed the empty box over the front end and slammed the full one onto the tray. Dave grabbed the pig-tail of ammo which was hanging out and laid it in the receiver. Then he slammed down the feed cover with his left hand and yanked the charger with the other in a nearly simultaneous motion, and the gun let loose again.

'Streams of tracers poured from every weapon on line. The fire was withering, but still the NVA came out of the jungle. We killed them, but more took their place. There was a sea of NVA, and I found it didn't pay to aim. Just load, point, shoot. Load, point, shoot! I put out round after round. I stopped to reload Dave and then went back into action. I was going through rounds so fast that the barrel was getting hot; at this rate, my ready supply would soon be exhausted.

'Bang! I felt a close concussion, and Dave rocketed out from behind the gun. What the hell? The ammo box sizzled and rounds cooked off! I looked at my left knee. I'm hit! It didn't hurt—it was more a warm, glowing sensation like a fire. A fire?

'From down in the ditch, one of the medics yelled up, asking if I'd been hit too. Hit too? Dave. Damn straight, I'm hit! But I knew he wasn't going to come up to fix it. Well, I thought, if we are burning, I'm not going to stay up here with several thousand rounds of .50cal. and 7.62mm down below.

'I grabbed the M79, tossed it over the side and bailed out over the rear. Opening the small rear door, I went in to get the wooden 90mm packing case in which I carried my hoard of M79 rounds.

With its trim vane raised, this M113A1 APC displays the gaudy four-colour camouflage scheme, extending to the crewmen's helmets, adopted by US 7th Army in Europe during the 1970s. The M113 APC has no nickname in US service beyond 'PC' or 'Poppa Charlie'. (MoD)

I had been saving these for the last few weeks, ever since we had been put on allocations after our ammo dump went up during a rocket attack.

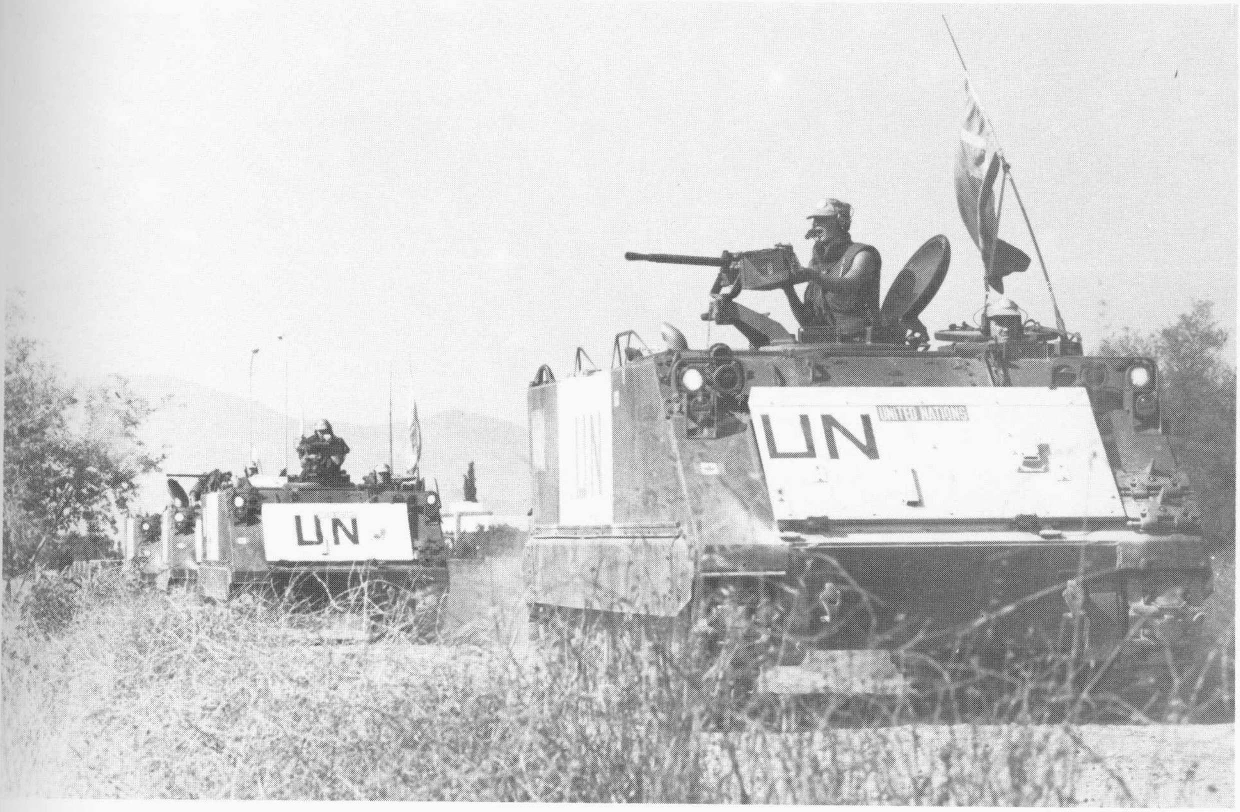
'I tossed the case out the door, jumped out and dogged the door behind me. Whop! An RPG tore into No. 33. If I had been inside I could have said goodbye. I dropped prone. Where in the hell is that damn M79? I had been disoriented when I tossed it over the side—I found it directly in the line of fire, about six feet from the vehicle. I slithered out on my belly, got it and retreated to what little cover the tracks afforded. At least I wasn't out in the open and I had an unrestricted field of fire.

'Suddenly, the asphalt road in front of me exploded in a shower of fragments—and I couldn't see! Chunks of asphalt cut my face, and my lip was puffed up and bleeding. I scrunched back a little farther behind the tracks and finally managed to focus. If the NVA on the other end of that AK had used just a fraction more elevation, he'd have hit me.

'The NVA numbers grew, despite the intensity of our fire. Point, shoot. Get those rounds out.

'Whop! Another RPG hit No. 33. She wouldn't need the $2\frac{1}{2}$ pages of parts and equipment to get her ready to pass inspection. I'd joked about losing the paperwork, since she probably would be junk before the stuff arrived. Suddenly the joke no longer seemed funny. One of the other APCs had been hit too, and was burning. RPGs flew behind us, in front as they fell short, and heavily to my right, all up and down the line. Both dump trucks had been hit and their gravel was strewn all over the road.

'I heard the snap, snap of incoming overhead. Off to my right front, a head popped up every so often from behind a wall attached to a small hootch. I aimed and waited for the head to reappear. Poomp, Crash. Shit! Too high! I



Besides its combat use in numerous conflicts of the past 20 years, the M113 has been widely employed by contingencies of the United Nations for peace-keeping duties. Bearing prominent marking panels, Canadian M113 APCs of the UN Peace Keeping Force in Cyprus (UNFICYP) patrol a road near Nicosia, August 1974. (UN)

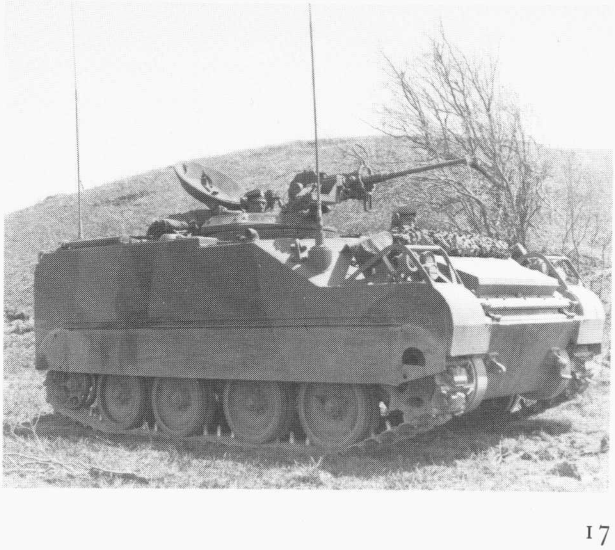
reloaded feverishly. The second round hit just below the lip, tearing out a big chunk of wall and part of the roof.

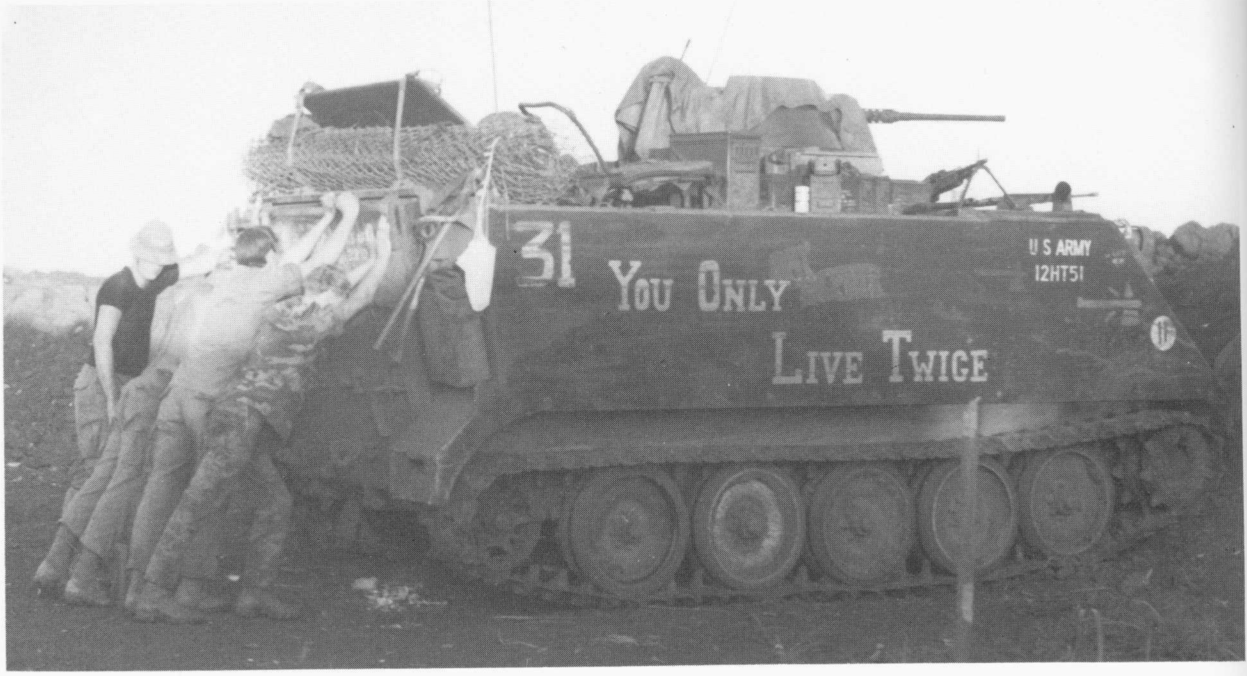
'I blindly reached for another round. But now I had to feel around for the dwindling supply. I tried to pace my rate of fire, but then decided to shoot them all now, while the NVA were still far enough out for the warhead to arm. The remaining rounds went in no time, except for two spares in my right trouser pocket—just in case!

'Just then I saw him, an NVA making a run from the hootch. I stood up and grabbed an M16 from the vehicle, threw off the safety to full-auto. I emptied the magazine as the NVA vanished in a cloud of dust and lead. I ducked back, peered out a second later and saw nothing but a bundle of rags which moments before had been an enemy soldier.

'The three of us made our way south to join the rest of our dismounted troops. Our section leader told us to get to the far side of the road and head north toward Trang Bang. As I crawled up the bank, my knee hurt—and worse, it was stiff and would not bend. That meant that all I'd be able to do was walk across that open road. It would be

Sometimes referred to as the 'M113½', the M113 Command and Reconnaissance (C&R) vehicle was developed in 1966 by FMC, utilising many components of the M113 APC, as an agile scout vehicle with superior mobility to wheeled vehicles. The C&R was adopted by the Netherlands Army and, in 1968, by the Canadian Army with some design changes under the designation Lynx. Here, a Lynx of the Canadian Forces in Germany conducts a reconnaissance mission. (Canadian Forces Photo)





Typical of the extravagant markings applied to some AFVs in Vietnam is this M113A1 APC of 4/23rd Infantry (Mechanized) as it prepares to move out from Fire Support Base Lynch near Xuan Loc, November 1970. Above the title YOU ONLY LIVE TWICE **is the name** DAY TRIPPER **in 1960s psychedelic lettering, while behind and also below the vehicle registration numbers are stylised tomahawks—referring to the nickname of 4/23rd Mech. (US Army SC659825)**

suicide. Larry and Lloyd broke and ran across. They made it.

'I stretched myself out and started rolling across. I stopped for just a second when I saw one of the engineers break from the ditch. He ran halfway across the road and turned toward the NVA. His M16 was dirty, so he had to cock it manually. He did this, fired once, and was cocking it again when a burst caught him. He spun around and hit the road, screaming and writhing in agony. It was horrible, but lasted only a few seconds. He lay still. I rolled even faster and reached the ditch almost immediately. We regrouped and started to get organized. Now was no time to panic.

'Number 38 and the other functioning APC prepared to pull out and all the troops who could scrambled aboard. We were too far away, and there was simply no more room. Jeff threw her into gear, and `tromped the accelerator. She leaped forward, the other following closely.

'I remember looking up at "The Ugly American" as she tore by us. I could see my friends aboard and the looks on Jeff, Howie, T. J., Jack, Arty and Doc's faces. There was no question of their stopping or even slowing for us. A sitting target could be hit many times in the space of a few seconds. I knew they hated to leave us. But our unit was going to be overrun and those who could live to fight another time would be foolish to throw their lives away on a gallant but hollow gesture. The engine sound faded as they escaped, RPGs following them.'

Grievously wounded in the legs—an enemy round set off the propellant of the M79 rounds which he describes keeping in his pocket in the account above—Kestell was to lie alone on the sun-scorched battlefield throughout that day. He survived being looted by NVA soldiers, and being strafed by Allied gunships and bombarded by artillery, before he was eventually rescued at nightfall.

Major Production Variants

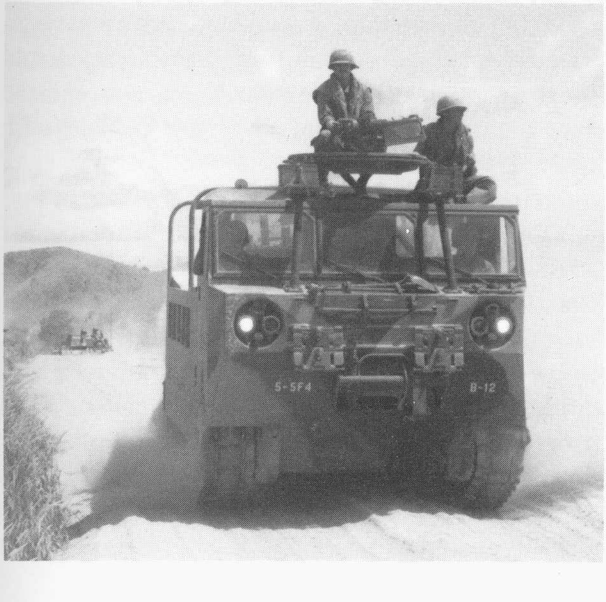
Since it first entered service with the US Army in 1960, the M113 has been produced in larger quantities than any other American armoured vehicle. By 1964, 10,000 vehicles of the M113 family had been produced. In 1970 the number reached 40,000 and today the total stands at over

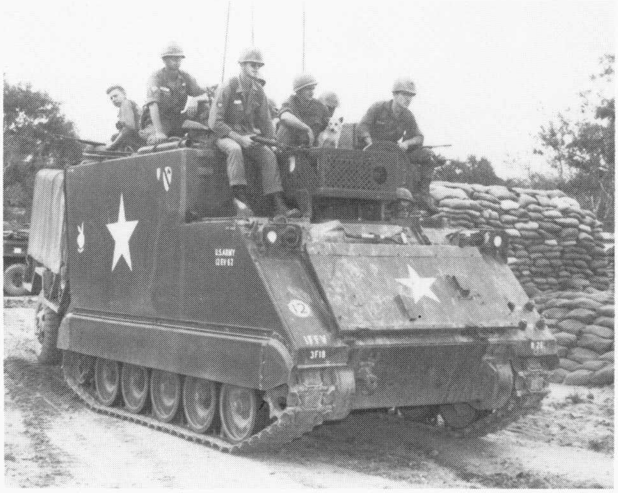
70,000, including 4,000 built by Oto Melara for the Italian Army and for export. Manufacture continues with no abatement of orders.

Production on such a vast scale leads to a low unit cost, which in turn makes possible availability in greater numbers within a given budget. At one time the M113 cost as little as $22,000. Despite the ravages of inflation, the current cost is approximately $100,000, which in real terms represents virtually no increase. Obviously, the actual cost depends on many factors such as model, volume of order and individual requirements of the customer. The low procurement and maintenance costs have attracted many buyers, and the M113 is in service with the armies of over 50 nations.

The versatile M113 has spawned a whole host of special purpose variants based on the standard chassis. The wide variety of applications has led to scores of vehicles, both proposed and actually manufactured. Besides these, there have been numerous modifications in foreign service. Many of them are of a minor nature related to changes in armament or fittings. If these are included, the total number of variants in the M113 Family of Vehicles (FOV) runs into three figures; but only the principal systems that have been used operationally or are about to enter widespread service are described and illustrated here.

An M548 Cargo Carrier of Battery B, 5th Battalion, 4th Artillery, of 1st Brigade, 5th Infantry Division (Mechanized), transports ammunition to Fire Support Base Holcomb in Vietnam, July 1970. The M548 proved invaluable for logistical support over the marginal roads and hostile terrain of Vietnam. The M548 can carry a six-ton payload, and the front-mounted winch enables the carrier to recover itself from soft terrain or ditches. (US Army SC657309)



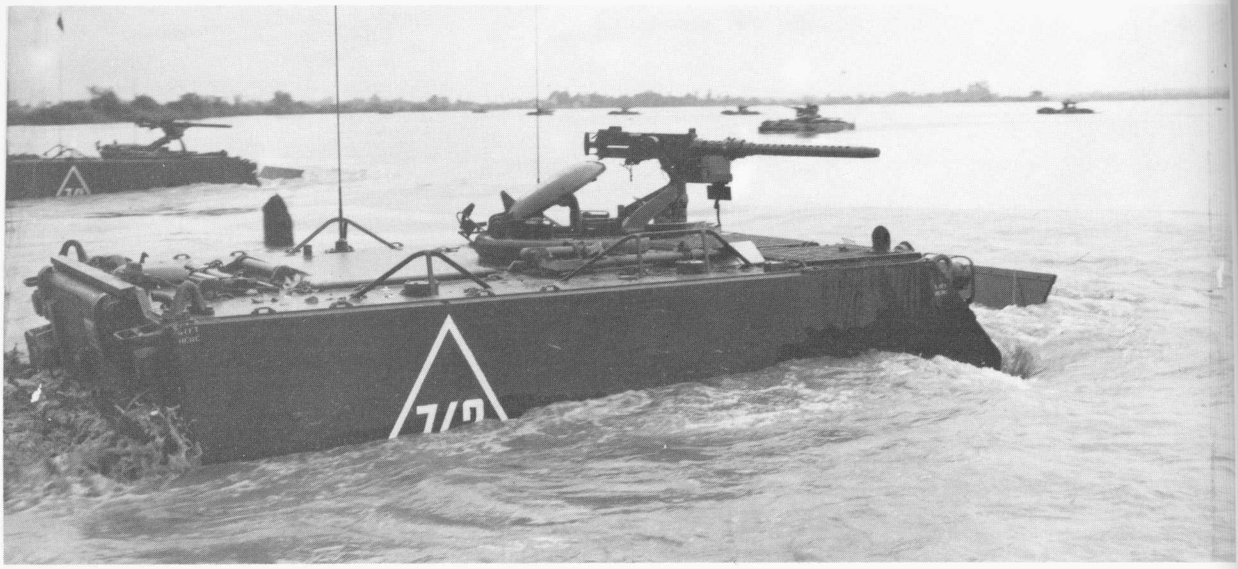


An M577 of Battery B, 3rd Battalion, 18th Artillery, enters Camp Radcliff after operations in the field in support of 1st Cavalry Division in Vietnam, August 1966. The letters IFFV denote 1st Field Force Vietnam ('Eye Force Vee' when spoken), while above is the vehicle weight classification. Markings on the hull side are the divisional patch of First Cavalry with a diminutive 1st Field Force insignia beside it, and the commonplace Playboy Bunny emblem beyond the national white star. (US Army SC632931)

Throughout its life, FMC has continually improved the M113 series to keep abreast of technological and tactical innovations. As a result, the loaded weight of the M113 has risen from the original 11.75 tons and has reached 14 tons in the M548. The decreasing power-to-weight ratios have lessened performance, and reliability is lower due to the greater strain on major components.

In consequence, FMC has introduced a series of improvements, many of which derive from the development cycle of the AIFV. The M113A1 Modernization Program is divided into three aspects. The first is designated as the Suspension and Cooling Product Improvement Program (PIP), the second as the Improved Power PIP and the third as the Extended Vehicle Program. The first two aim at improving RAM-D (Reliability, Availability, Maintainability and Durability), while the Extended Vehicle Program will provide new capabilities for greater loads on both M113A1 and M548.

The Suspension and Cooling PIP applies to the standard M113A1 and incorporates a revised



Unlike the majority of its contemporaries, the M113 is fully amphibious without preparation—an attribute that proved itself in full during the Vietnam War. M113s of the 7th Mechanized Rifle Company, one of the first two ARVN units to be equipped with the vehicle, train for waterborne operations prior to deployment in the Mekong Delta, 1962. (USIS)

cooling system with the position of the fan and the radiator reversed, allowing the vehicle to operate at higher ambient temperatures without overheating, and also extending engine life. The improved suspension provides a smoother cross-country ride and an increase in speed of about 3mph by means of high-strength torsion bars, greater roadwheel travel, and an extra set of shock absorbers at the second roadwheel station to control vehicle pitch. These features were introduced into the production line in July 1979, and vehicles so fitted are classified as the M113A2.

Various options are available for the M113A2 including a dual air source heater which allows employment of a collective CBR system; and external, rear-mounted fuel tanks which reduce the chance of secondary fires when hit and increase interior hull space by 20 per cent. The US Army has not adopted these fuel tanks in series but several foreign customers have, including Israel (see colour plate G2).

The weight of the M113A1 APC is 24,600lbs. Other members of the M113A1 family such as the M106A1, the M730 and M548 have reached combat loaded weights of 26,450, 27,775 and 28,400lbs respectively. All the vehicles possess the same power plant, and power-to-weight ratios range from 17.1 HP/ton for the M113A1 APC to as low as 14.8 HP/ton for the M730. Weights of other M113A1 vehicles have also increased disproportionately due to the incorporation of heavier weapon systems, such as the Improved TOW Vehicle. Increasing vehicle weights require an increase in engine power to retain performance characteristics and reliability.

This has been achieved through the Improved Power PIP by replacing the GMC 6V53 (210bhp) diesel with the turbo-charged version, 6V53-T (275bhp). The present power train is replaced by the X290-3 Detroit Diesel Allison transmission which incorporates hydrostatic steering to provide smoother turning and reduced shock load on the suspension, while its greater efficiency results in more horsepower at the sprocket, and fuel savings. The driver's controls have also been changed, and the conventional steering levers have been replaced by a steering wheel and foot brake. Vehicles with these features, together with those of the A2 model, are classified M113A3.

Further improvements are being investigated for the M113 FOV. These include a high-output heavy-duty electrical system, a ballistic liner inside the vehicles to ameliorate the effects of shaped charge attack, a fire suppression system to enhance crew survival, new night sights and CBR protection among others.

The Extended Vehicle Program relates to experimental models of the M113A1 and M548 with longer hulls and one additional set of road wheels to allow more cargo or troops to be carried. These 'stretched' versions are designated M113A1-S and M548A1E1.

M48 Chaparral Forward Area Air-Defense Missile System

The Chaparral is an adaptation of the successful US Navy Sidewinder 1C air-to-air infra-red homing missile to a mobile surface-to-air weapon system. Chaparral is fired from a four-rail launcher designated M54 mounted on an M730 chassis, a modified version of the M548 Cargo Carrier.

Developed by the Aeronutronic Division of Ford Aerospace and Communications Corporation, the M48 was placed in production in 1966 and entered service with the US Army in 1969. The first missiles (MIM-72) were identical to the Navy version, but an improved model (MIM-72C), featuring an improved proximity fuze and a new high explosive blast-fragmentation warhead over twice the size of the original, entered service in July 1978. A further improved model (MIM-72F) has a smokeless engine to reduce the battlefield signature, and a new guidance system increases resistance against infra-red countermeasures such as high-intensity flares dispensed from aircraft.

The Chaparral was devised as a clear-weather, daylight system whereby the gunner either acquires the target visually, or is informed when targets are approaching by the AN/MPQ-49 FAAR (Forward Area Alerting Radar), since the M48 itself is not equipped with radar. Once the target is detected, the gunner tracks the aircraft in his optical sight until an audible tone in his headset notifies him that the target is within infra-red sensing range. The missile is then launched and its heat-seeking guidance takes over, the proximity fuze assuring detonation even without a direct hit.

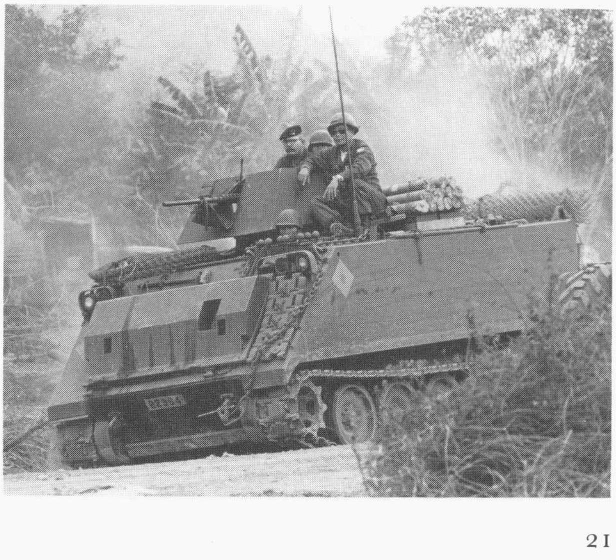
The M48 is currently being fitted with a Forward-Looking Infra-red (FLIR) thermal-imaging device to give a night-time capability. The FLIR sight will also improve the system's performance in daylight smoke and haze. The missile has a maximum range of 5,000 metres and a maximum effective altitude of about 2,500 metres.

The M730 Chaparral Missile Carrier has the engine and crew compartment at the front with the M54 missile launch station at the rear. The collapsible crew compartment is folded down and covered by blast plates. The launch station is mounted on an extendable base which is lowered for travelling and raised for firing. The M54 has 360° traverse and the launcher rails an elevation of +90° and depression of −5°. The launching sequence can be operated by a single crewman.

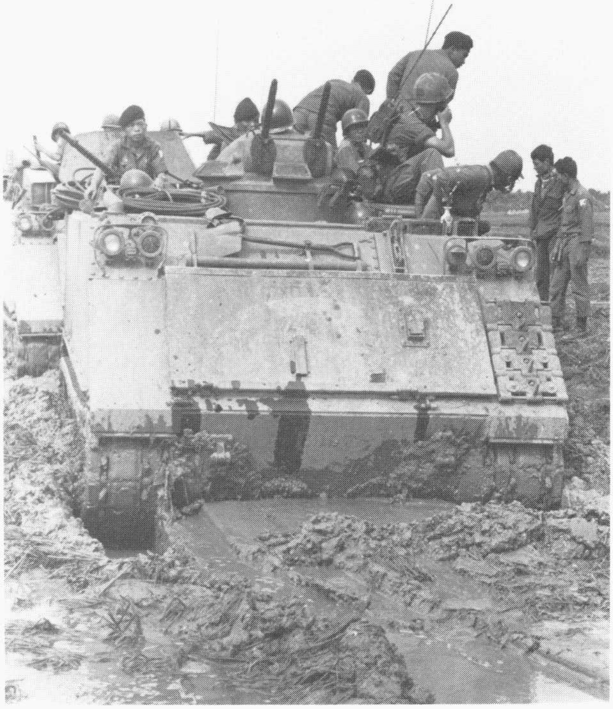
The Chaparral is employed in Air-Defense Battalions in conjunction with the M163 Vulcan. It is expected to remain in service with the US Army into the 1990s. The Israelis have used the Chaparral in combat during the October War of 1973 and in Lebanon.

M106 Armored Self-Propelled 107mm Mortar and M125 Armored Self-Propelled 81mm Mortar

Both the M106 and M125 share the same configuration on a modified M113 vehicle. The hull top has been altered to accommodate a large circular three-piece hatch hinged at the hull sides. The mortars are mounted on the rear hull floor which has been reinforced to absorb recoil shock. The 4.2in. (107mm) M30 mortar of the M106 faces rearwards and fires through an arc of 43° to right of and 46° to left of centre. The 81mm M29 mortar is mounted on a turntable with 360°



Carrying the indispensable RPG screen on the rear hull, an ARVN M113 APC moves forward with the vehicle commander behind the driver (unlike on US APCs and ACAVs, where he manned the .50cal. Browning) and his American adviser beside the gunner. Note the 'belly armor' extending up the lower hull front, and the hull side peppered by small arms fire. (Armor Magazine)



A number of M113 APCs in ARVN service were fitted with machine gun cupolas, such as this Cadillac Gage M74C type mounting twin .30cal. Brownings, to provide greater protection to the gunner. Although effective, these cupolas were not generally adopted as the .50cal. Browning gave greater firepower. There are many machine gun cupolas and enclosed weapon stations currently available for mounting on M113 APCs in order to increase firepower and protection. (US Army SC661438)

traverse. The M106 carries 93 rounds (M106A1, 88 rounds) of ammunition stowed along the hull walls. The M125 carries 114 mortar bombs. The M106A1 and M125A1 diesel-powered versions were produced from 1965.

The M30 mortar fires HE, illuminating and smoke ammunition out to 5,650 metres at a sustained rate of fire of three rounds per minute. The M29 81mm mortar fires HE, illuminating and WP to a range of 4,700 metres at a sustained rate of fire from four to 12 rounds per minute depending on the type of ammunition used.

The US Army has adopted the British L16 81mm mortar (XM252) as a replacement for the M30 and M29. The XM252 has a range of 5,775 metres, matching that of the M30, but has far superior minimum-range performance. The 81mm bomb weighs only one-third as much as the 4.2in. round, but on account of the XM252's high sustained rate of fire of 15 rounds per minute, the total weight of a timed bombardment is almost as great as for the M30. Both the M106A1 and M125A1 will be re-armed in due course, by which time the mortar carriers will incorporate the improvements of the M113A2. Other users of the M106 have modified their mortar carriers to accept 120mm mortars in place of the M30. Germany has modified her vehicles to accept a Tampella mortar, Switzerland the M64, Israel the Soltam and Italy a Thomson-Brandt weapon.

M132 Self-Propelled Flame Thrower

The M132 is a modified M113 APC with the commander's cupola replaced by an M10-8 flame gun and 200 gallons of fuel stored in the troop compartment. The flame gun has an effective range of 150 yards and sufficient fuel for 30 seconds of firing. Production of the M132 was undertaken by FMC at Charleston, West Virginia: 201 M132 vehicles and 150 of the diesel-powered M132A1 type were built before production ceased in 1965.

Prior to this, M10-8 flame thrower kits had been despatched to Vietnam in 1962 for fitting to existing M113 APCs. M132s were widely used by both US and ARVN forces in Vietnam, where they were nicknamed 'Zippos'. Flame thrower units were supported by an armoured version of the M548, the XM45E1, acting as a service vehicle for fuel replenishment. The M132 is no longer in active service with the US Army.

M163A1 20mm Vulcan Air-Defense Gun

The companion of Chaparral in the US Army's composite divisional Air-Defense Battalions, the Vulcan is a revolving six-barrelled gun mounted on a derivative of the M113 APC, designated M741.

Under the auspices of the Aircraft Equipment Division of the General Electric Company, development of the Vulcan Air Defense System (VADS) began in 1964 involving a self-propelled version (M163) and a towed model (M167) mounted on a single-axle M42 carriage for airborne and airmobile operations. Trials of the tracked system were conducted in 1965 and production began in 1967. The M163 was accepted into service in August 1968, and later in the same year a test platoon of six vehicles was despatched to Vietnam for combat trials; they were used mainly for convoy escort in the absence of an enemy air threat.

Vulcan is a fair-weather daylight system. The fire control system consists of a Range-Only Radar that can track targets out to 5,000 yards, and a lead-computing gunsight with which the gunner tracks the target. The radar is slaved to the optical line of sight and supplies target range and range-rate information to the sight generator. With this data, the sight automatically computes the future target position and adds the required super-elevation to engage the target. The tracking time necessary to establish the lead angle is about one second. A green light appears in the sight optics when the radar has acquired the target and the aircraft is within effective range. The gun is then fired.

The M61A1 20mm six-barrelled gun is a derivative of the Gatling gun used on jet aircraft. Two rates of fire are available to the gunner: 1,000 rounds per minute for use in the ground role, and 3,000 rounds per minute against aircraft. Bursts of ten, 30, 60 or 100 rounds can be fired at the higher rate. The vehicle carries 2,100 rounds of ammunition of which 1,030 are ready to fire, the remainder being in reserve inside the hull.

The turret is electrically traversed and elevated. The weapon has 360° traverse with an elevation of +80° and −5° of depression. The maximum effective slant range for air defence is 1,600 metres, partly owing to the self-destruct mechanism of the M246 High Explosive Incendiary Tracer ammunition. Maximum horizontal range in the ground role with the contact-fused M56A3 High Explosive Incendiary rounds is 4,500 metres.

The M741 Vulcan Weapon Chassis is a modified M113 with a suspension lock-out mechanism to provide a stable platform on firing, an additional circular hatch in the roof in place of the standard troop compartment hatch, and floatation cells on the hull sides and trim vane to retain an amphibious capability with the heavier weapon system installed.

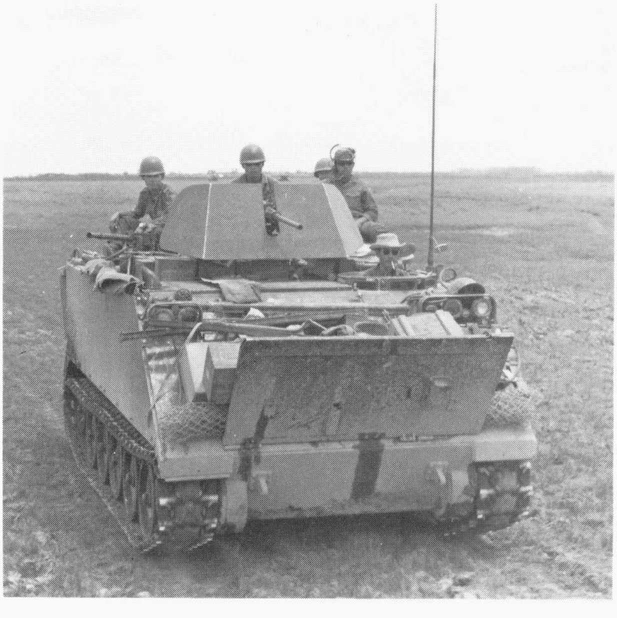
The US Army has 379 M163A1s in its inventory (the M163A1 has an upgraded radar); each battalion has 24 M163s (two batteries of 12 guns each) and 24 Chaparral systems (two batteries each with 12 launchers). The Vulcan has seen combat in Vietnam, with the Moroccan Army against the Polisario Front, and with the Israelis during the 1973 War and in Lebanon in 1982—when an M163 was credited with shooting down a Syrian MiG aircraft.

M548 Cargo Carrier

The XM548 was designed in 1960 to meet a US Army Signal Corps requirement for a highly mobile transporter to carry assorted equipments such as the AN/MPQ-32 Hostile Artillery Radar System. The vehicle incorporated automotive components of the M113 but proved unsuccessful, so a modified version with a diesel engine, the XM548E1, was developed using the powerpack, suspension and components of the M113A1. Trials of three prototypes were conducted in 1964, and the vehicle was type-classified the following year as the M548 Cargo Carrier. Production began in late 1965 at FMC's plant in Charleston, West Virginia.

The M548 is an unarmoured logistical support vehicle for transporting ammunition and supplies over difficult terrain. The engine and crew

Vietnamese armour personnel were the first to fight mounted from M113 APCs rather than as mechanised infantry to assault positions on foot. Subsequently, gun-shields were added to protect the .50cal. gunners, and .30cal. Brownings were fitted either side of the troop compartment for greater firepower, as on this M113 of ARVN 10th Armoured Cavalry Regiment in Cambodia, May 1970. (US Army SC655817)



compartment are at the front and the full-width cab accommodates four men sitting abreast. The cargo compartment, which can carry a payload of six tons, has a rear opening secured by two watertight doors. The upper door is hinged on the side. The lower door, which mounts the towing pintle, is hinged on the bottom. Forming the cargo deck are six hollow aluminium extruded plates that are bolted in place in either of two positions: the upper position provides a continuous flat bed, while the lower permits carrying more cargo or offers leg room for seated personnel. The cargo area can be enclosed by using a standard vinyl-coated nylon cover-supported by aluminium bows.

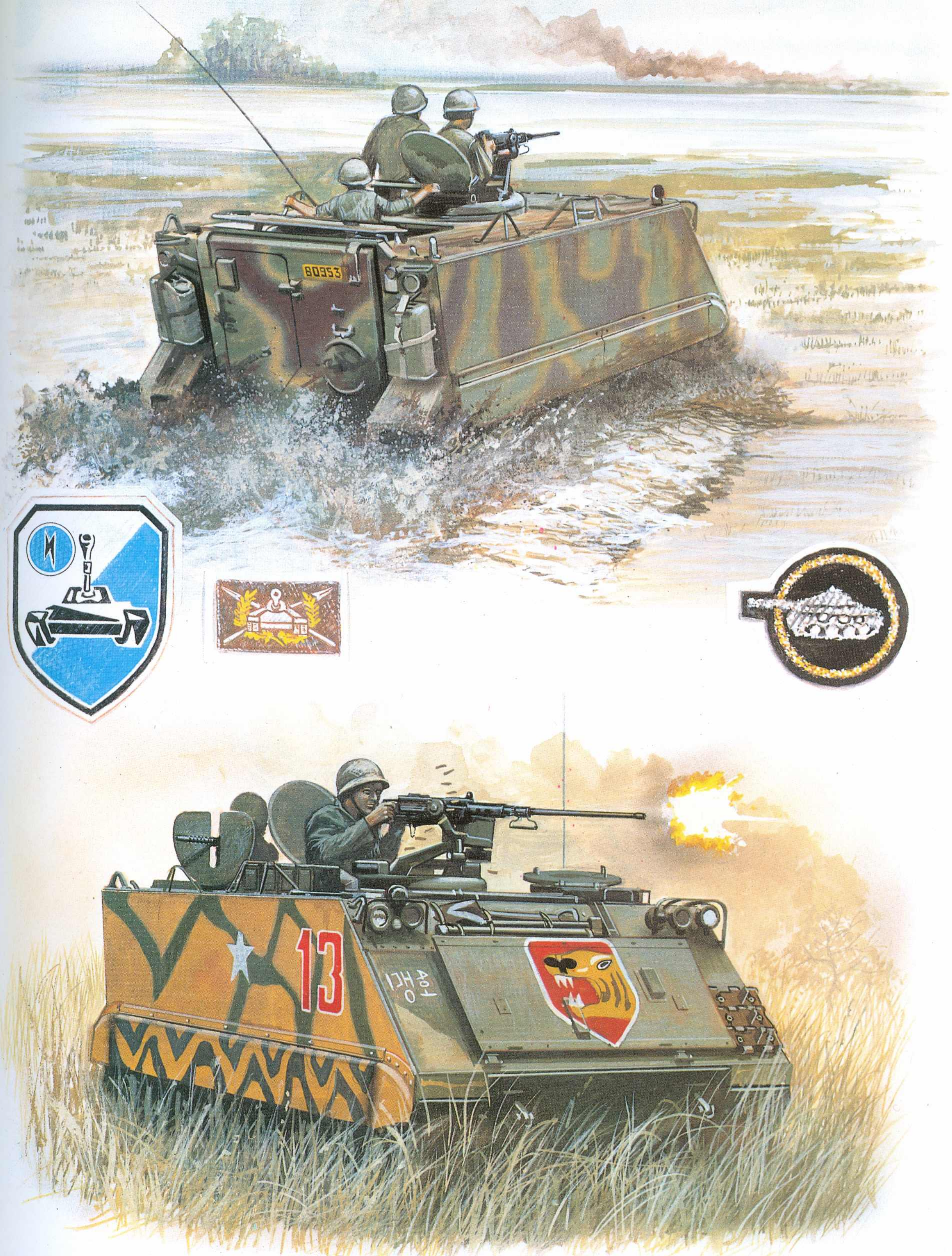
The M548 has the same running gear as the M113A1, but, being heavier when loaded, has torsion bars of greater diameter, and the final drives have a different gear ratio. The vehicle is fully amphibious and is propelled in water by its tracks, although this is no longer a requirement in the US Army. An M66 machine gun mount allows either a .50cal. or 7.62mm machine gun to be fitted over the cab. For handling heavy stores, a 1,500lb-capacity chain hoist and trolley can be mounted on an I-beam attached to the second rear cargo cover bows, allowing loads within three feet of the tailgate to be lifted and positioned anywhere within the cargo area.

The versatile M548 chassis has been adapted for a variety of specialised roles, and derivatives include the M667 Lance Missile Carrier, M727 HAWK Missile Carrier, M730 Chaparral Missile Carrier and the RCM748 Tracked Rapier. Many countries have modified their M548s for other uses, carrying radars, fire control systems, mine dispensers, or as the basis for indigenous anti-aircraft weapons such as the Italian Indigo–ME1 Mobile Air Defence System.

The current model of the M548 series is the M548A1 Cargo/System Carrier, incorporating improved cooling and suspension components which give increased engine life, reliability and higher cross-country speeds.

In 1977, FMC developed a stretched version of the M548 with an additional set of wheels to provide greater cargo space or larger area as a weapons station platform. Classified as the M548A1E1, it features a 300bhp turbo-charged engine and a transmission with hydrostatic steering. This version forms the basis of the Swiss Oerlikon GDF-CO3 'David' 35mm SPAA System.

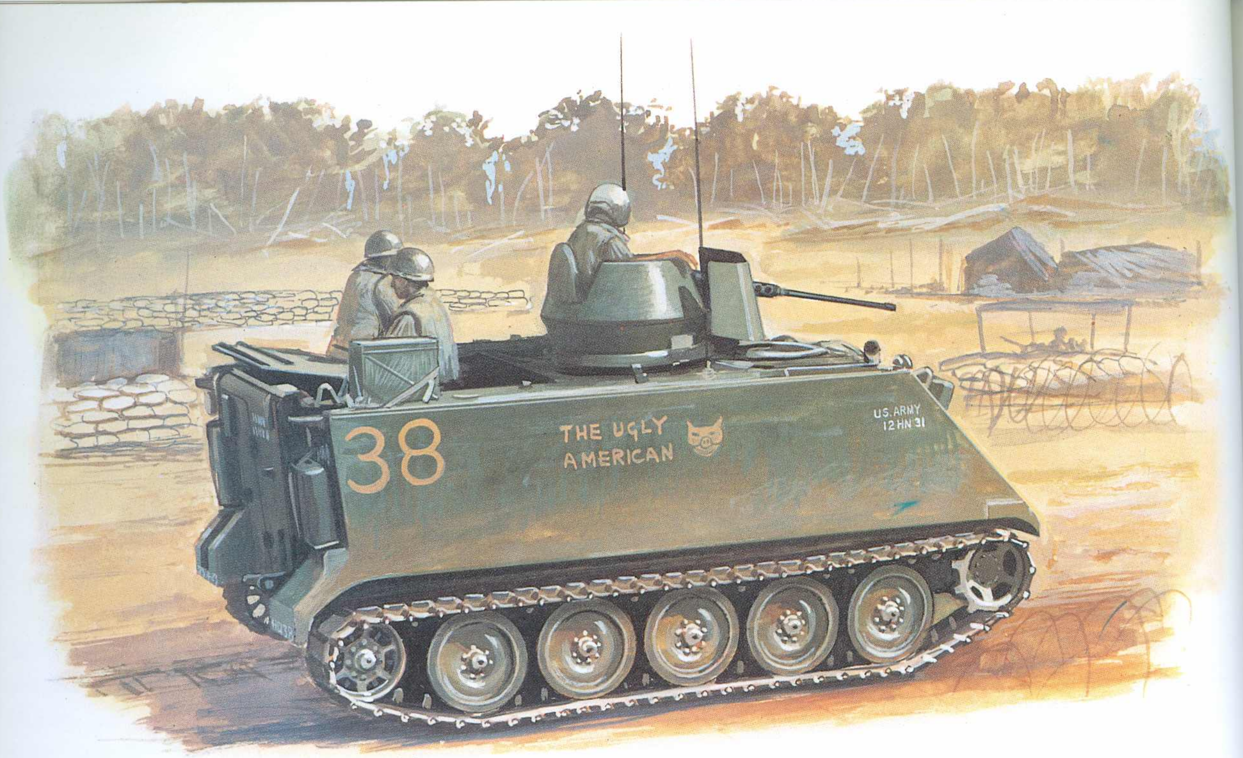
ARVN M113 APCs and an M577 command vehicle of Task Force 255 advance through the Parrot's Beak area of Cambodia during the 1970 incursion. Note the abundance of stowage on these vehicles; the wooden box, carried by so many ARVN APCs and seen here on the top rear quarter of the left-hand M113, contained the crew's food and cooking utensils. (US Army SC655819)



1: M113 APC, 21st Mech. Rifle Co., ARVN 21st Div.; 1962

2: M113 APC, Armor Regt., ROK Capital Div.; 1967

A


38
THE UGLY AMERICAN
U.S. ARMY
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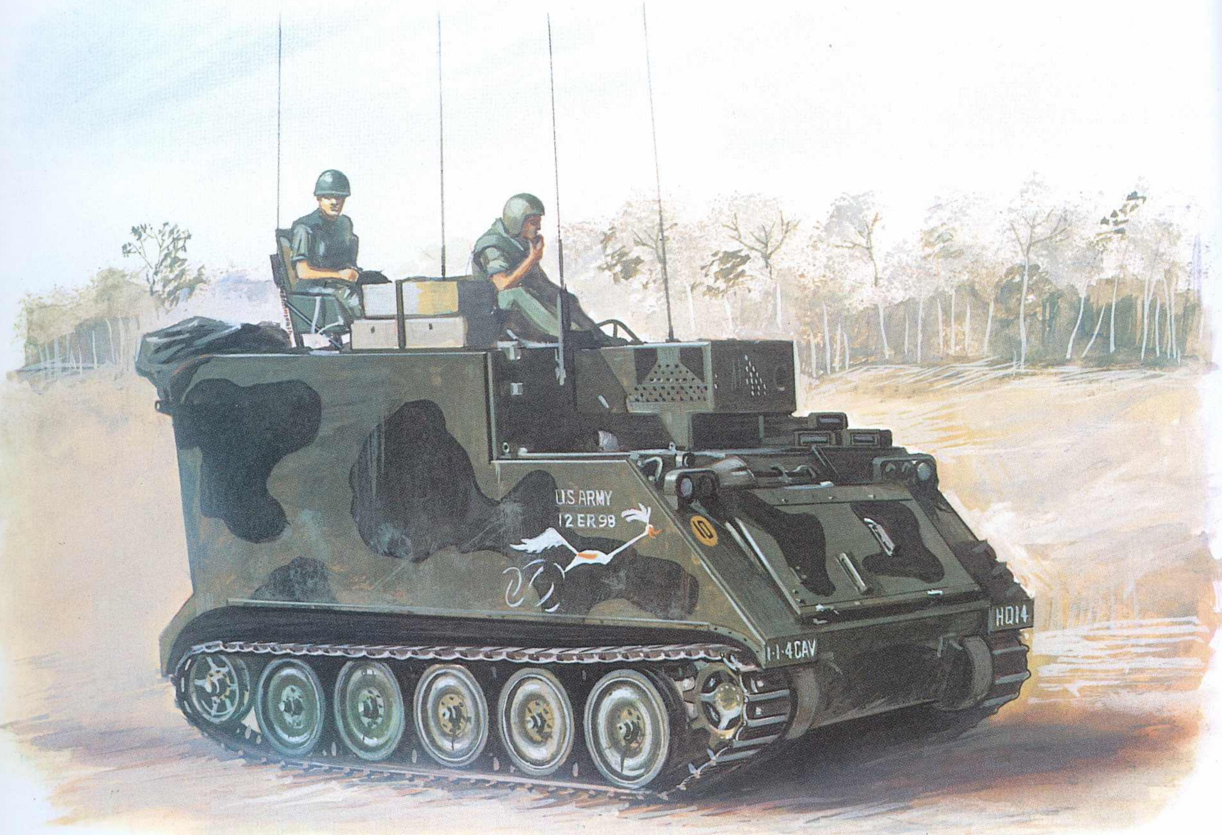
1: M113A1 APC, US 4/23rd Inf.(Mech.), 25th Inf.Div.; 1968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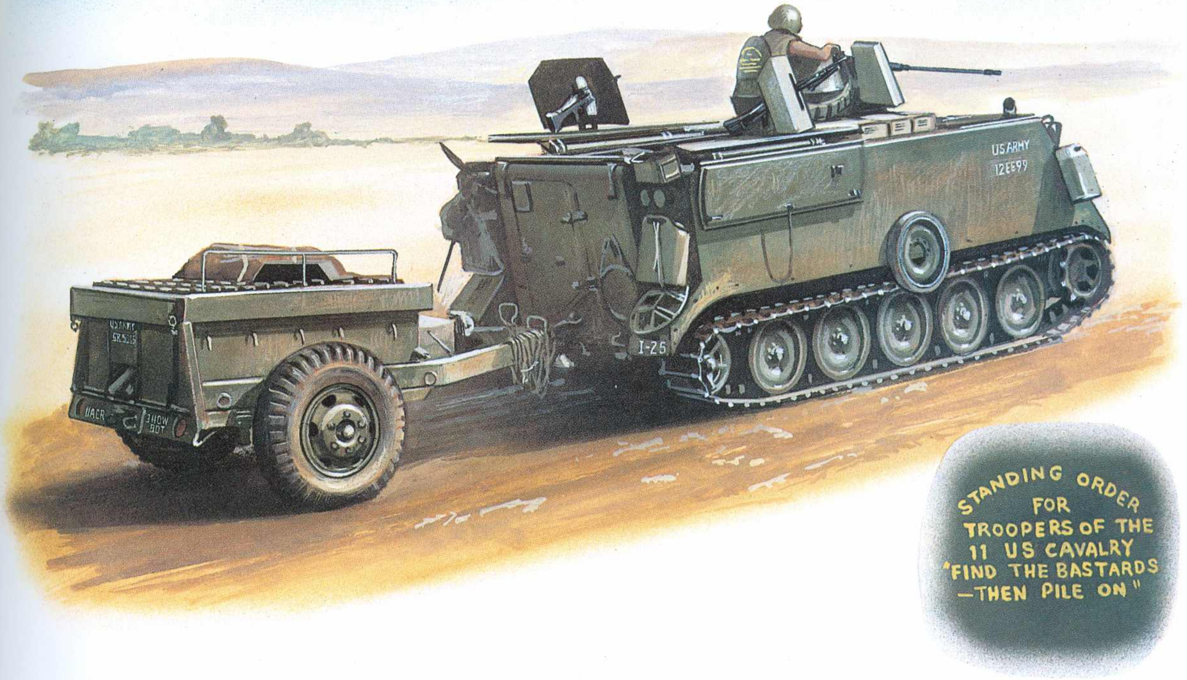
2: M577A1, US 4th Cav., 1st Inf.Div.; 1968

B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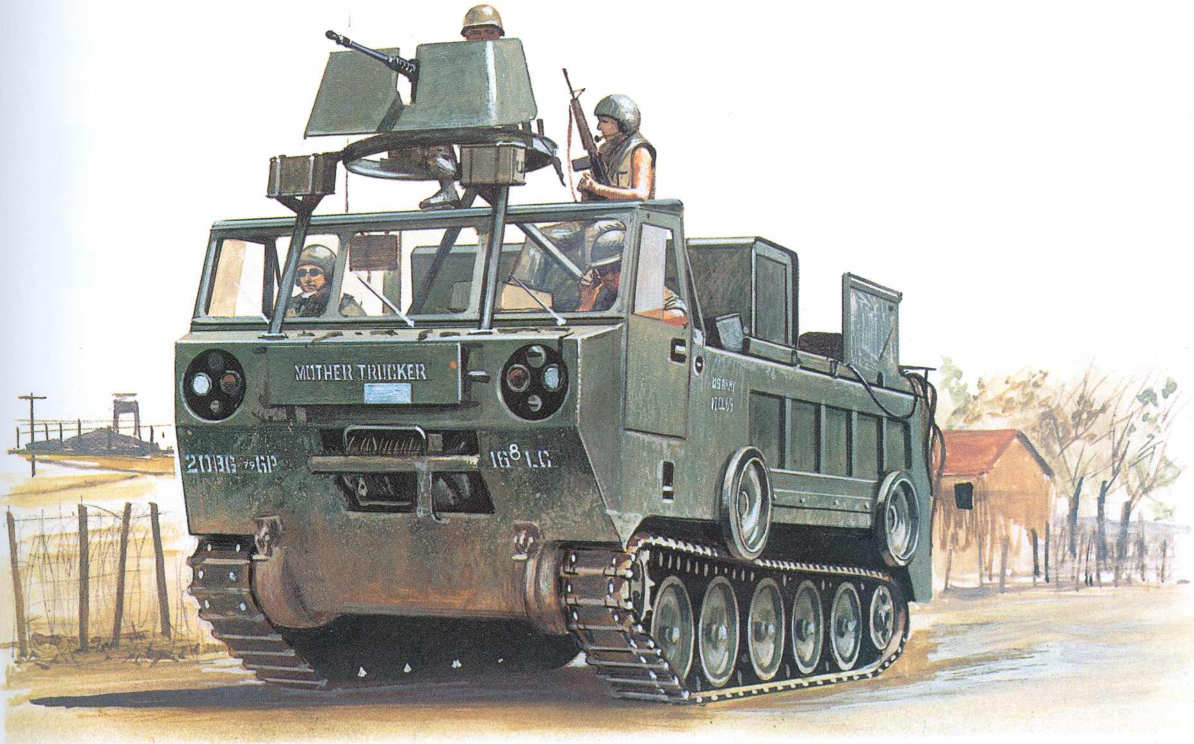
FOR
TROOPERS OF THE
11 US CAVALRY
"FIND THE BASTARDS
—THEN PILE ON"


MOTHER TRUCKER
US ARMY
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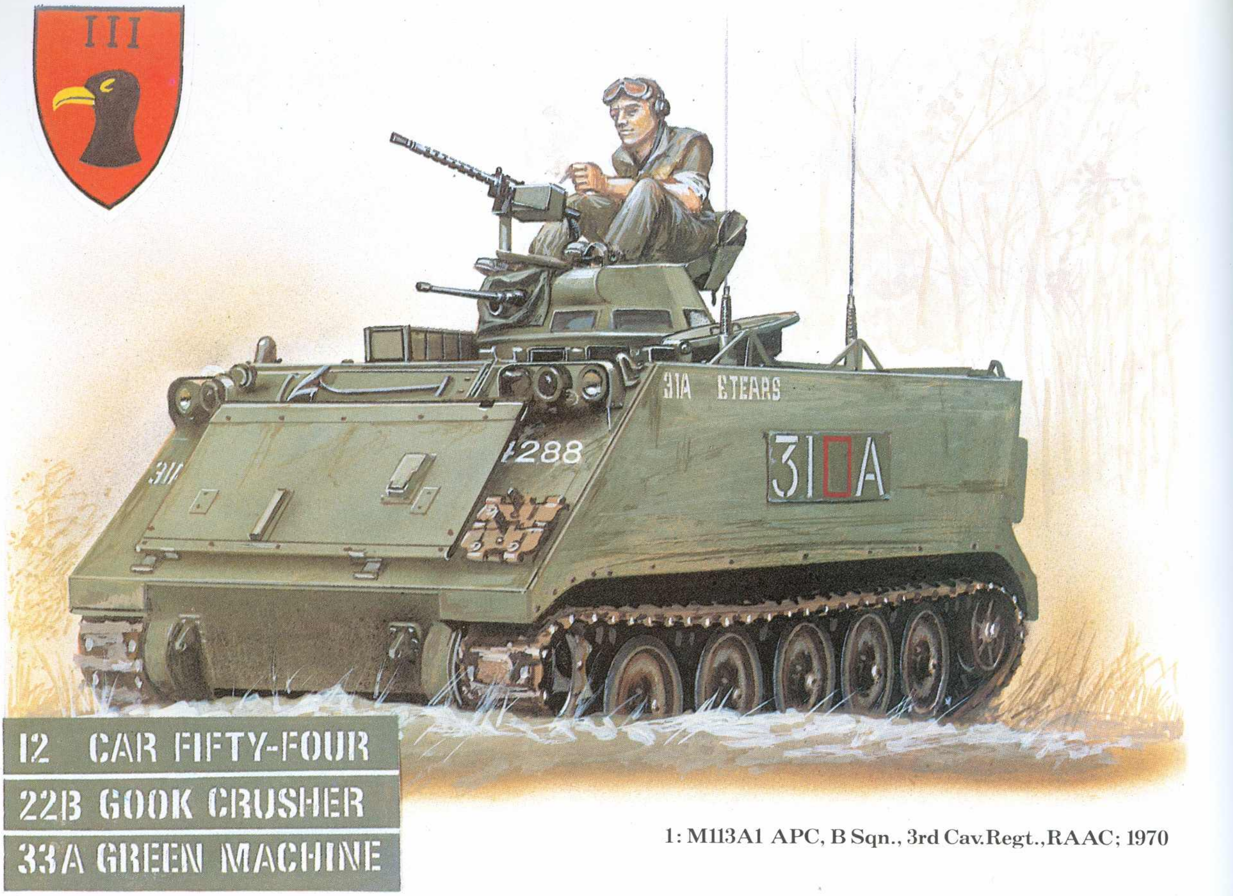
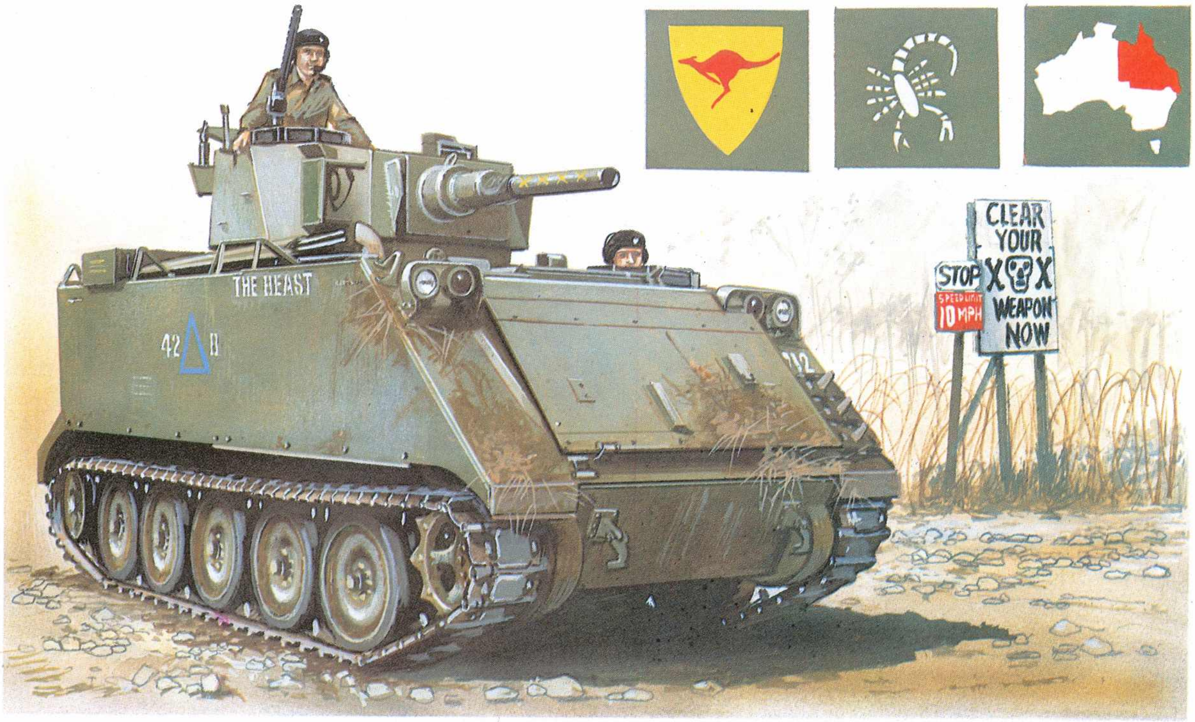
168 LG

1: M106A1, US 11th Armd.Cav.Regt.; 1969

2: M548, US 168th Eng.Bn.; 1969


III
31A ETEARS
4288
31□A
31A
12 CAR FIFTY-FOUR
22B GOOK CRUSHER
33A GREEN MACHINE

1: M113A1 APC, B Sqn., 3rd Cav.Regt., RAAC; 1970


THE BEAST
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42
STOP
SPEED LIMIT
10 MPH
CLEAR
YOUR
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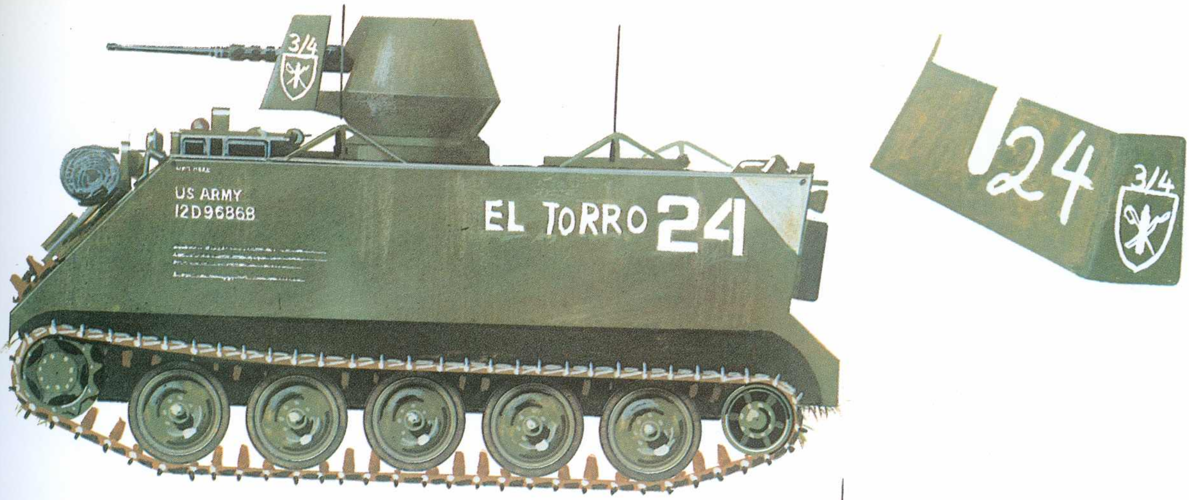
WEAPON
NOW

2: M113A1(FS), A Sqn., 3rd Cav.Regt., RAAC; 1971

D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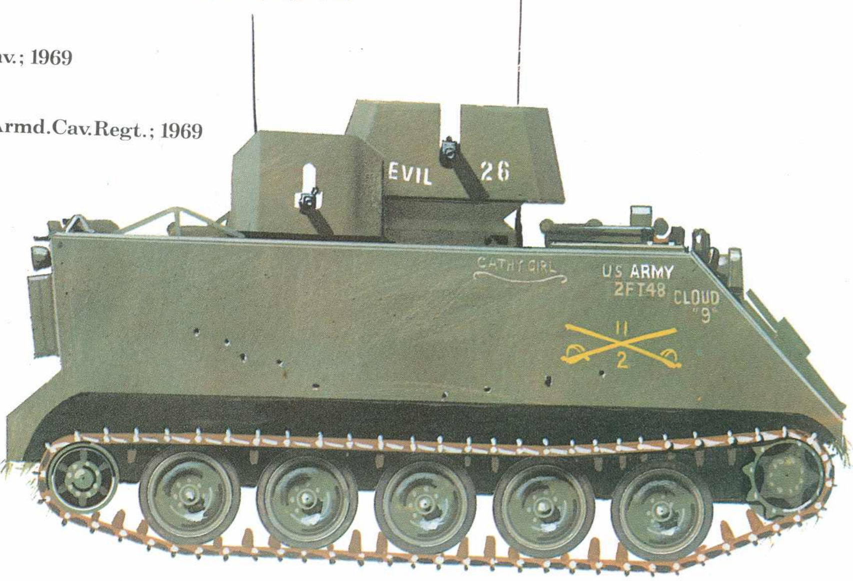
1 : ACAV, Troop B, 3rd Sqn., 4th Cav.; 1969

2 : ACAV, Troop E, 2nd Sqn., 11th Armd.Cav.Regt.; 1969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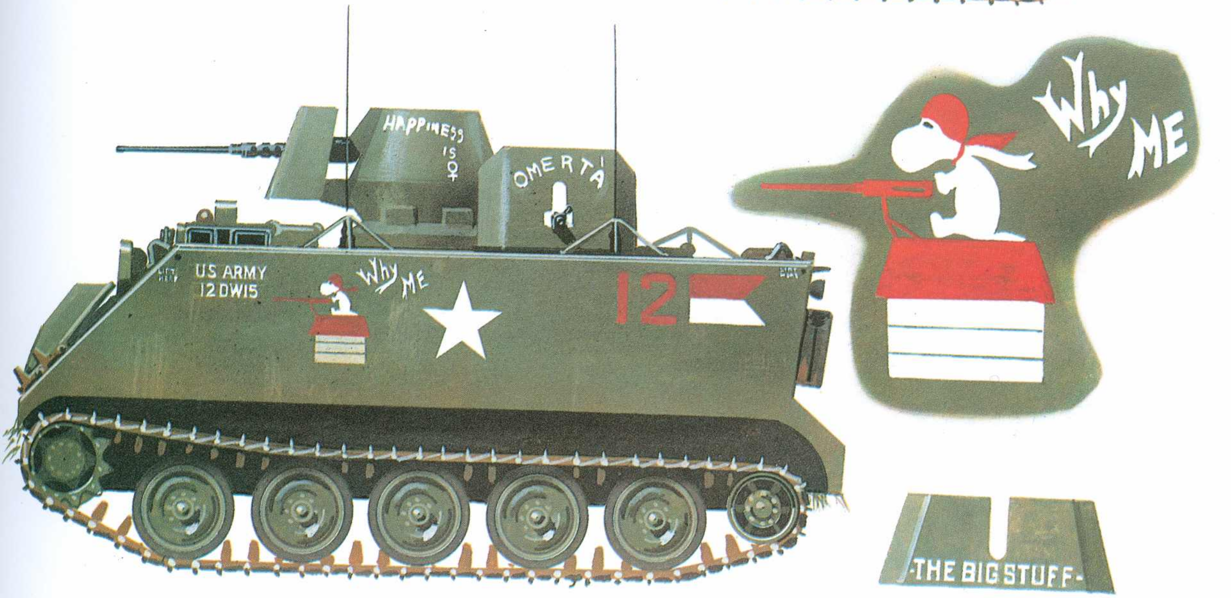
HAPPINESS IS ♀
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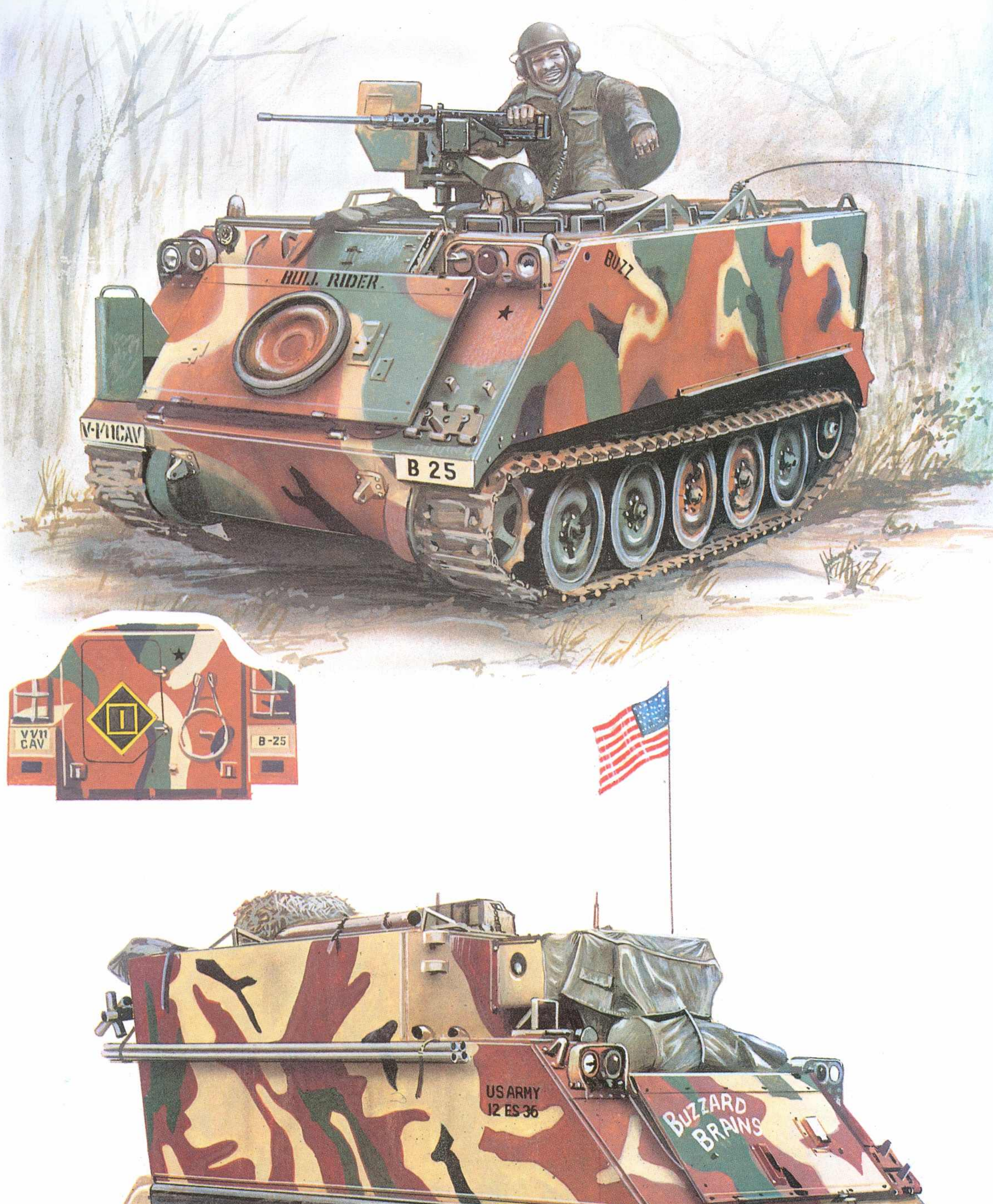
Why ME
-THE BIG STUFF-

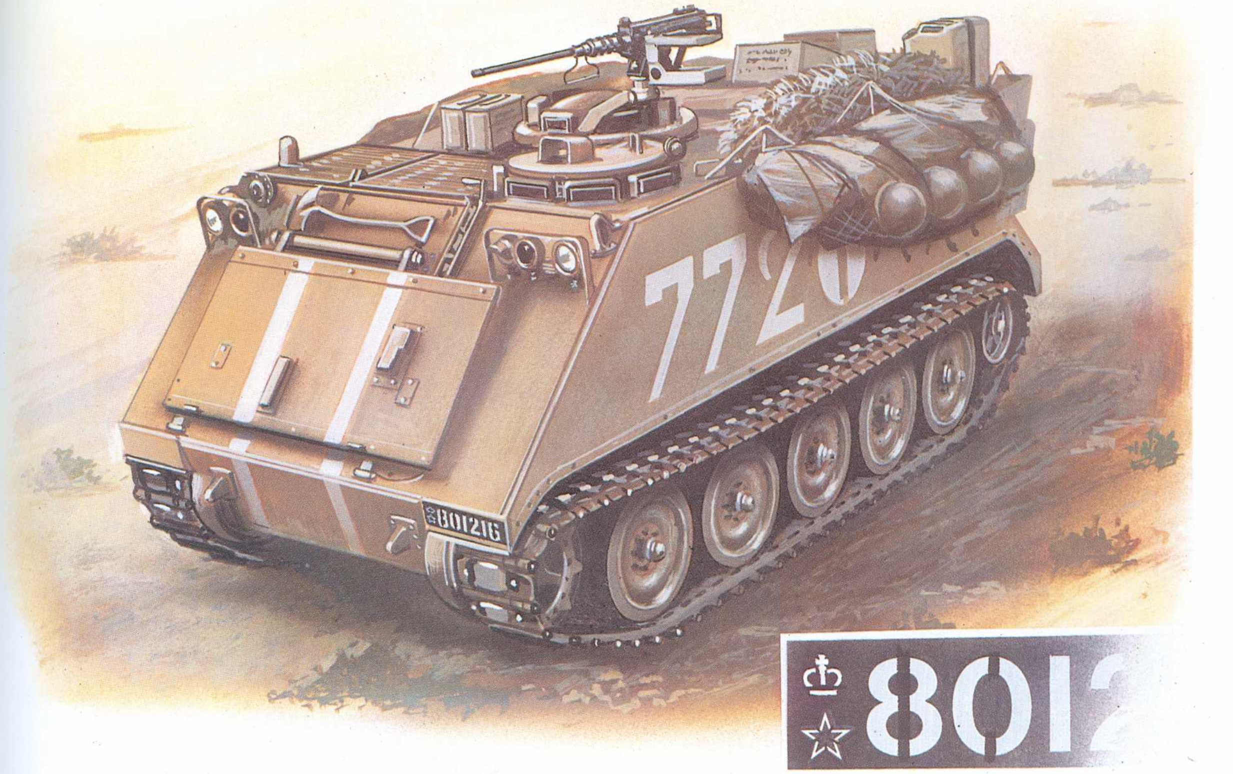
3: ACAV, Troop A, 1st Sqn., 10th Cav.; 1971


BULL RIDER
BUZZ
V-1-11CAV
B 25
I
VV11 CAV
B-25
US ARMY
12 ES 36
BUZZARD BRAINS
32F41
B17

1: M113A1(CSV), Troop B, 1st Sqn., 11th Armd.Cav.Regt.; 1981

2: M577A1 of a Battery Bn., Artillery, US 7th Army; West Germany, 1978

F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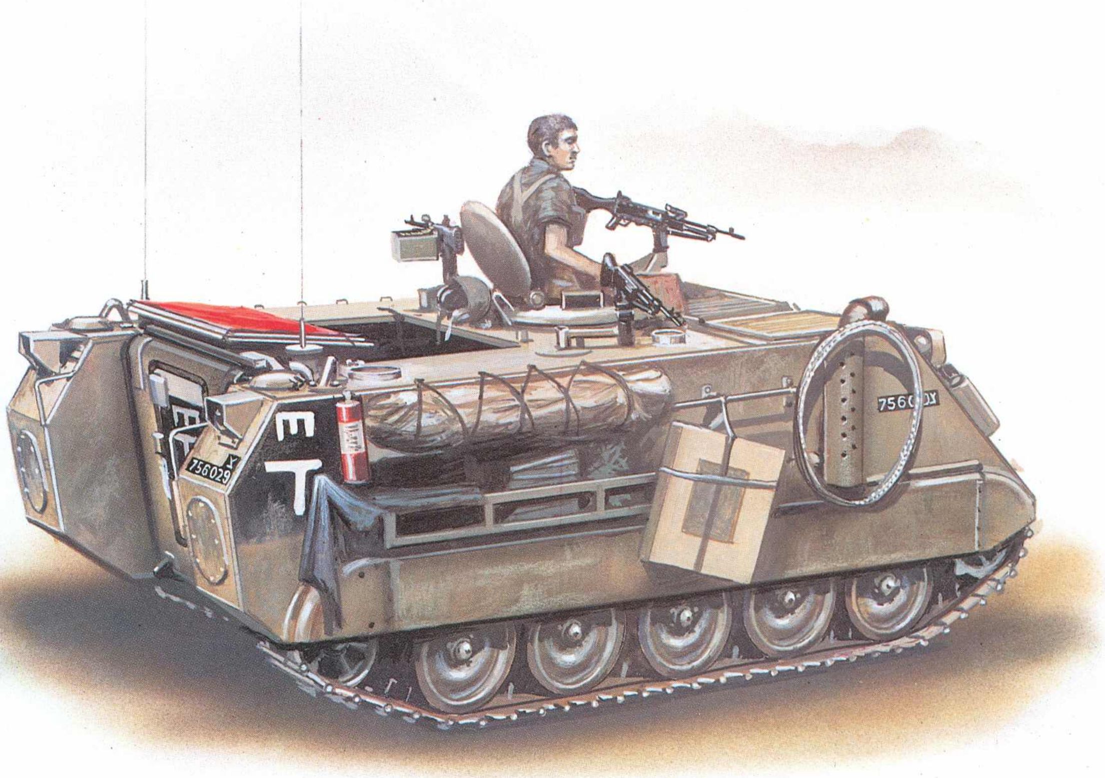
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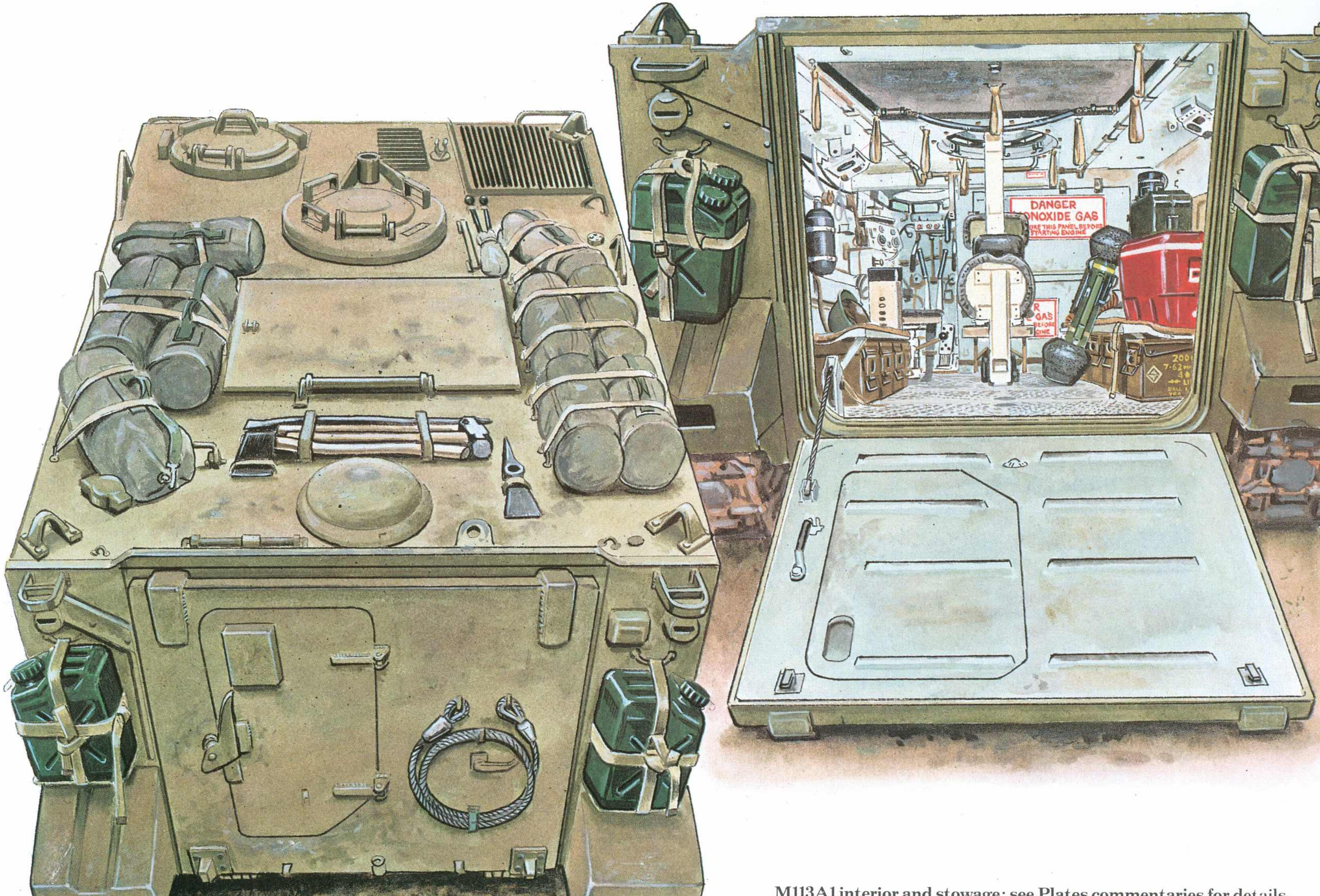
1: M113A2 APC, 8th Inf.Regt., Royal Moroccan Army; Sahara, 1979

2: M113A1 'Zelda', Israeli Defence Forces; Lebanon, 1982

H


DANGER
NOXIDE GAS
E THIS PANEL BEFORE
STARTING ENGINE
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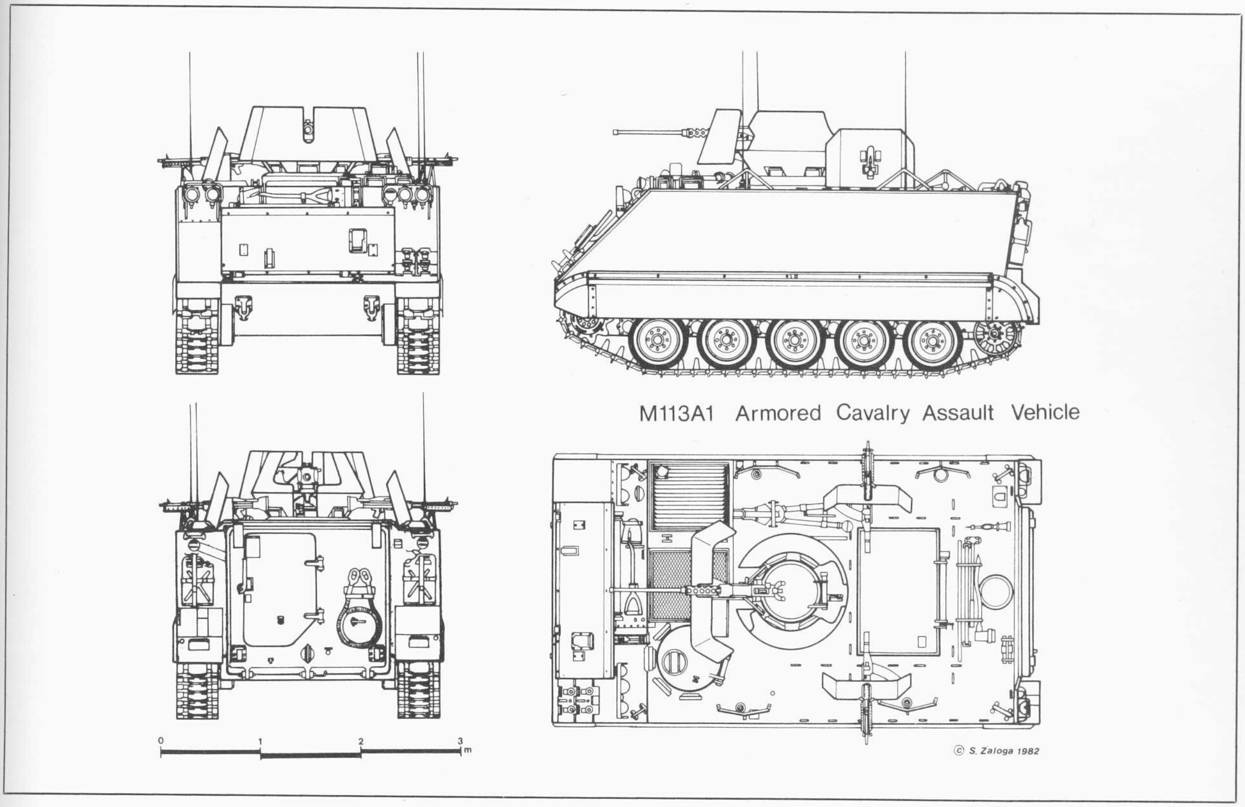
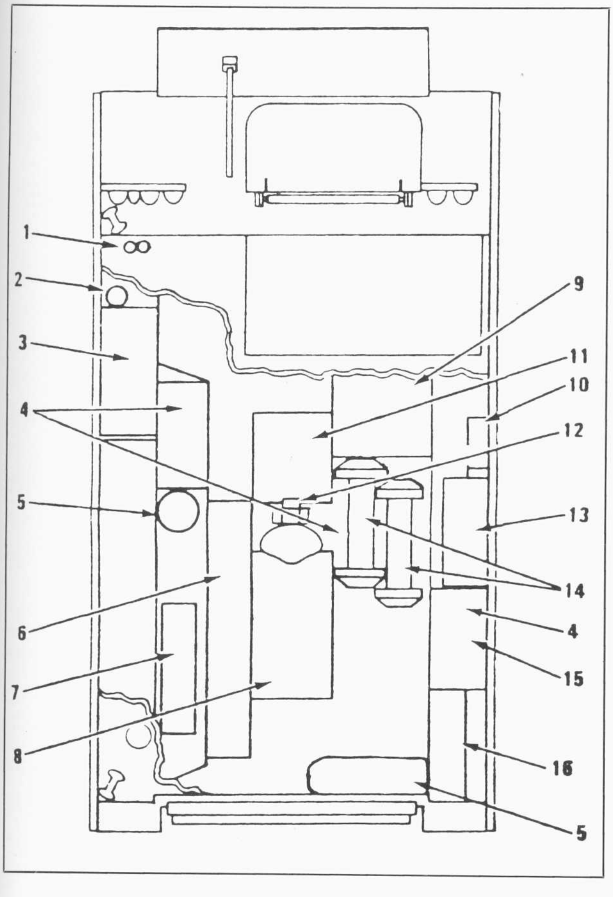
M113A1 interior and stowage; see Plates commentaries for details.





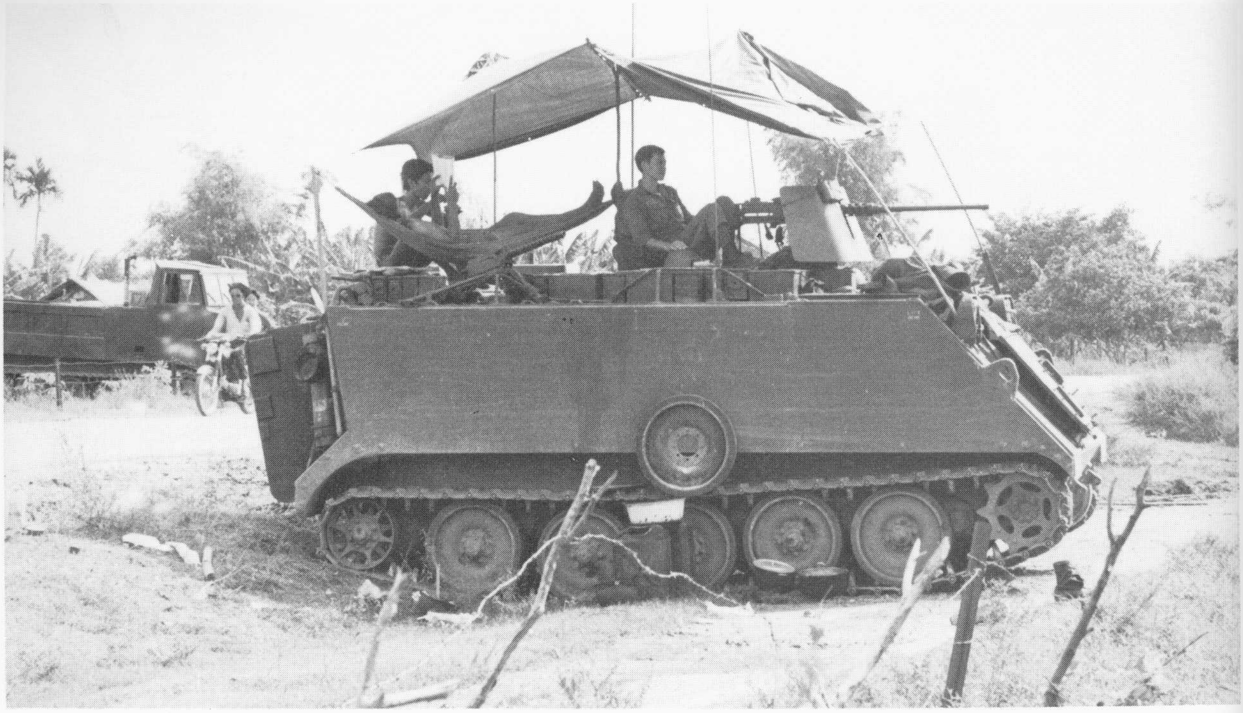
(Above) **1/76th plan of ACAV (Steven Zaloga)**

Internal stowage plan of the cavalry scout version of the M113: (1) Binoculars (2) M11 Decontaminating Apparatus (3) Reel Equipment CE-11, Radiacmeter, Cable Telephone WD-1/TT × 2, Antenna, Telephone Set TA-312/PT, Telescope, Night Vision Goggles AN/PVS-5 × 2 (4) Alice Packs × 5 (5) Duffel Bags × 5 (6) Ammunition Boxes (7) M60 MG Kit strapped to wall (8) Bedrolls × 5, Combat Meals × 2 cases (9) Night Vision Sight AN/PVS-4 (10) Dragon Tracker (11) case Combat Meals, Squad Box for weapon cleaning kit, spares, batteries etc. (12) Radio Set AN/PRC-77 (13) Night Vision Sight AN/TVS-5 (14) Dragon Missile Rounds × 6 (15) Chemical Overgarment, Boots and Gloves × 5 (16) Map Canister.

M577 Carrier, Command Post: Light Tracked

The first few prototypes of an Armored Command Post Vehicle designated XM577 were converted from existing M113 APCs at Detroit Arsenal in early 1962. Production was begun in November by FMC and the vehicle was type-classified as the M577 in March 1963. The first order for 270 vehicles was completed between December 1962 and May 1963. The M577 has been built, off and on, for the US Army and Foreign Military Sales ever since.

The M577 is based on the M113 chassis with an enlarged superstructure providing protection and



The crew of an ARVN M113 APC relax under a sunshade while standing guard on a roadside. The roof is lined with boxes of ammunition for the shielded M2HB Browning and for the tripod-mounted M1919A4 Brownings lashed to the rear hull top. Similar in concept to the ACAV, the vehicle had no designation in ARVN service but was known by crewmen as *cua sat*—'iron crab'. (Armor Magazine)

mobility for field commanders. The top of the hull has been raised two feet to provide full head room for personnel standing erect. The increased volume provides space for maps, radios and related equipment required for command functions.

The standard 85-gallon fuel cell has been replaced by two 60-gallon cells, one on each side of the vehicle, and each cell acts as the foundation for a 90in. table with three folding leaves. The commander's seat and cupola and .50cal. Browning have been eliminated to maintain an amphibious capability. A simple folding platform is substituted at the commander's station.

A 28-volt, 150-ampere (4.2kw) auxiliary generator is mounted on the front vertical hull plate. It may be run in position or used dismounted, to provide power for lighting and radios. A tent extension and poles are carried on the rear of the vehicle, providing a greater working area at the back with provision for operation under black-out conditions. Up to four M577 vehicles can be connected by these extensions.

As well as being used as a command post, the M577 is employed by artillery fire control units, signal units and as a mobile medical treatment centre. The M557A1 incorporates the changes of the M113A1, and the M577A2 those of the M113A2.

M667 Lance Missile Carrier for MGM52C Lance Battlefield Support Missile

Lance is currently the most powerful missile available to the tactical ground commander for engaging targets beyond the range of cannon artillery. The missile weighs 2,850lbs. and carries either conventional munitions or nuclear warheads of varying yields. The engine uses prepackaged storable liquid propellants to generate 46,460lbs. of thrust over a six-second burn time, giving a maximum range of 75 miles with a nuclear payload. Lance is no longer in production, but additional nuclear warheads are being procured by the US Army, including those of the enhanced radiation type to be held in reserve in the United States.

The missile is normally deployed on a tracked launcher accompanied by a loader-transporter vehicle. Both vehicles are derived from the M548 and are jointly classified as the M667 Lance

Missile Carrier. The M667 is the basic chassis for the following applications in the Lance system: the M752 Launcher, Guided Missile, Carrier Mounted which transports one missile on the launcher, and the M688 Loader-Transporter, Guided Missile which carries two missiles and a crane to load the M572 Launcher.

The US Army has six Lance battalions with a total of 36 launchers deployed in Europe, with a further two battalions in CONUS. The Lance is also in service with the armies of Great Britain, Israel, Italy, West Germany, Belgium and Holland, although not all these countries have nuclear warheads.

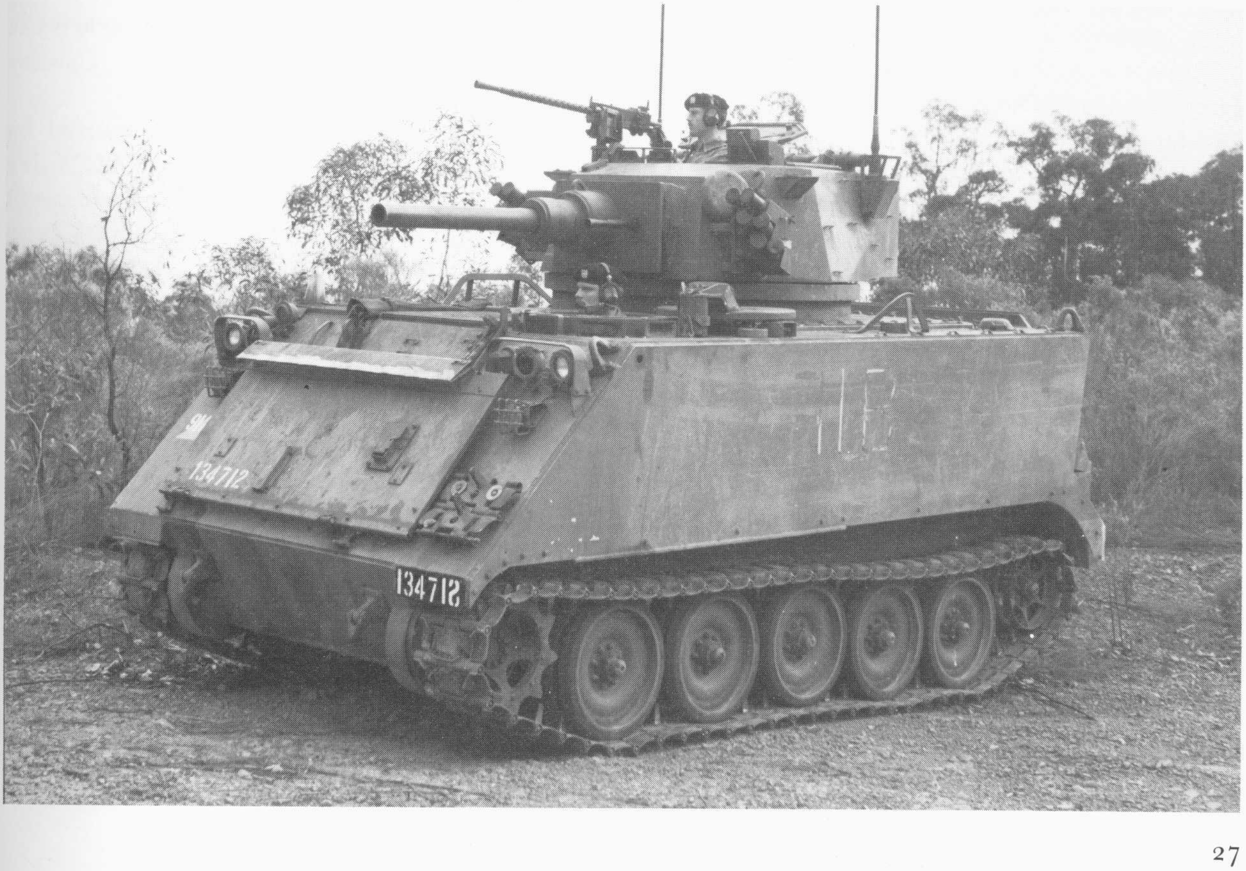
M727 HAWK Self-Propelled Surface-to-Air Missile System

The principal low- and medium-altitude air-defence missile in the US field forces, HAWK (Homing-All-the-Way-Killer) has been in service since 1962. The basic HAWK system lacked mobility, so a self-propelled version was devised based on a derivative of the M548, designated M727. The prototype of the M727 was completed in 1966.

The M727 HAWK Missile Carrier is similar to the M730 used with the Chaparral SAM system. Each carrier mounts three missiles which face forward over the cab during transit. In the firing mode, the missiles point rearwards for launching. A blast deflector, which can be lifted hydraulically for engine maintenance, protects the cab during missile launch. A suspension lock-out provides a rigid platform for firing, and electrical power for the missile system is produced by a generator driven by a power take-off from the vehicle engine.

The solid-propellant missile carries a proximity-fused HE warhead of 165lbs., weighs 1,400lbs. and is 16½ft. long. The guidance system is based

There have been numerous designs to develop a fire support vehicle based on the M113, to provide greater firepower in mechanised units without incurring the high costs of an MBT. One of the first and one of the few to see active service is the M113A1 FSV (Saladin) of the Australian Army. Sixteen of these vehicles were produced by marrying the 76mm-armed turret of the Saladin armoured car with an M113A1. It has now been superseded by a similar vehicle mounting a Scorpion CVR(T) turret. FMC offer an M113 FSV armed with a 90mm Cockerill gun in a Cadillac Gage turret, while Israeli Military Industries have produced a remarkable version known as MSWS Medium Support Weapon System armed with a hyper-velocity 60mm gun capable of armour penetrations greater than the British L7 105mm gun used in so many Western MBTs. (Department of Defence, Canberra)



The majority of M113 users employ an armoured ambulance version for the evacuation of battle casualties, capable of carrying four stretcher cases or walking wounded. Every M113 APC has standard fittings for conversion to this role. Displaying red crosses, this M113A1 APC(A) [Ambulance] of the Australian Army is pointedly named BLOOD BATH. **(Department of Defence, Canberra)**

on the semi-active principle.

A self-propelled HAWK platoon consists of three M727s, each carrying three missiles and towing one piece of ground equipment of the tracking and acquisition radars. Improved HAWK, first deployed in 1972, is capable of engaging aircraft from less than 100ft. to more than 38,000ft. in all weathers. The maximum effective range is about 25 miles. Self-propelled HAWK has only seen service with the US Army and Israel.

XM806E1 Recovery Vehicle: Full Tracked, Light Armored

An armoured recovery vehicle XM806 based on the M113 was developed under Project ENSURE during the Vietnam War for ARVN cavalry regiments operating in the Mekong Delta.

The XM806 was petrol driven, while the XM806E1 is an adaptation of the M113A1. It is equipped with a hydraulically driven winch inside the hull for retrieving immobilised vehicles under combat conditions. Winching operations may be accomplished with the ramp down and a protective guard in place, or through the ramp door, which gives additional protection for the operator. A spade is mounted on either side of the rear hull for use as a ground anchor when winching. An additional spade unit, stowed on the hull roof, may be mounted between the two outer ones for recovery in soft conditions. A manually operated hydraulic crane can be mounted on the left side of the hull for battlefield replacement of major components. A crew of three operate the XM806E1 and its equipment. The vehicle has not been type-classified by the US Army, hence the experimental designation. In the Australian Army it is known as the M806A1 Armoured Recovery Vehicle (Light).

M901 Anti-Tank Combat Vehicle (Improved TOW Vehicle) (ITV)

The M901 is an M113A1 or M113A2 APC fitted with an elevating two-launcher TOW turret which allows the missiles to be fired from hull defilade or from behind buildings with only the head of the launcher exposed to hostile view.

Developed by Emerson Electric Company, the first production vehicles were deployed to Europe in early 1980. The US Army has a requirement for 1,952 M901s to replace the older M113 TOW carriers in mechanised infantry battalions. The M901 is also employed by some armoured cavalry units (see Plate F2), pending introduction of the M3 Cavalry Fighting Vehicle. A five-man crew is prescribed for this role, with the extra man acting as an observer. In cavalry units the vehicle is not known as ITV but CTV, standing for Cavalry TOW Vehicle.

The launcher pod is raised and lowered by lifting arms and incorporates standard TOW day and night sights as well as a three-power target acquisition sight that can detect hostile AFVs at several thousand yards. The sight is set at 13× for missile aiming and guidance. The sight picture is relayed to the gunner located in the vehicle hull by means of an image-transfer assembly. The turret has 360° traverse at 35° per second, and an elevation range from +34° to −30°.

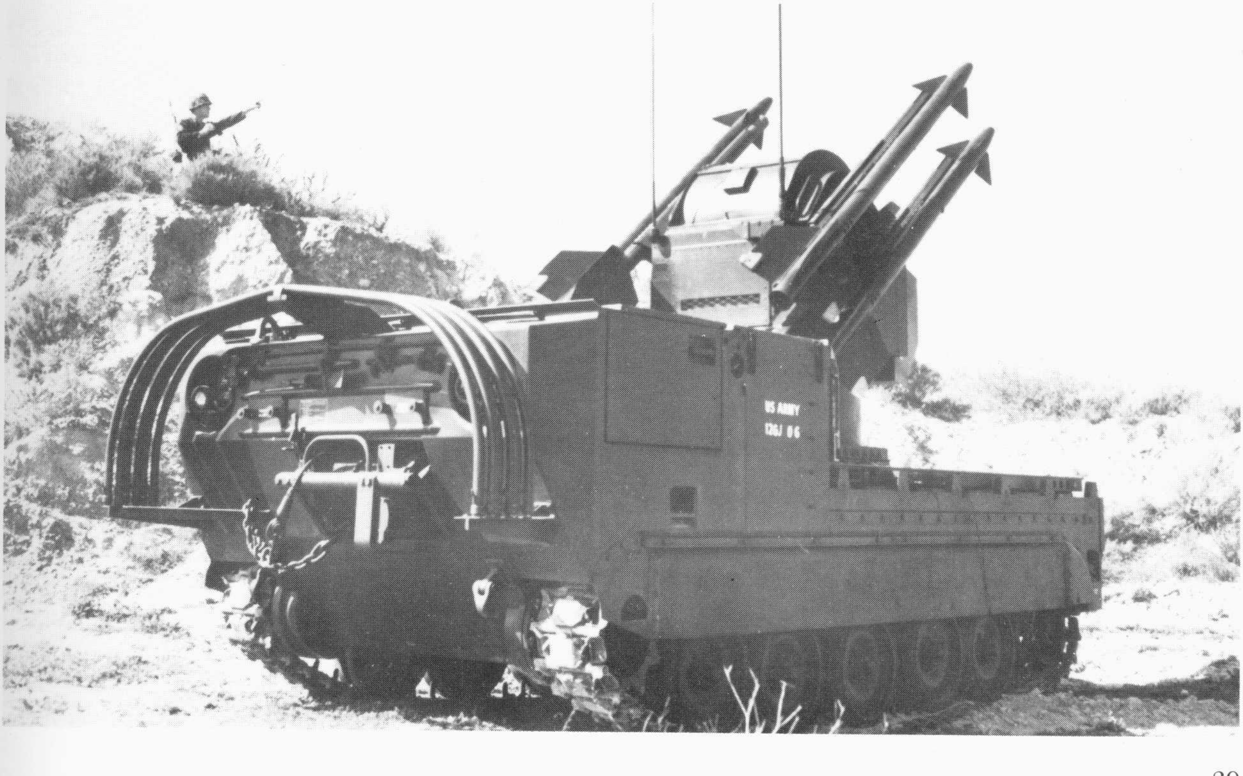
From the moment the vehicle halts, it takes only 20 seconds for the launcher to be raised and for the target to be engaged. A second missile can be fired within five seconds of first-round impact. The launcher is then tilted back to be reloaded through the partly open rear cargo hatch by a crewman who is protected from small arms fire by armoured side flaps and overhead cover. Reloading the two missiles can be accomplished in less than 40 seconds. In addition to the two missiles in the launcher, ten TOWs are carried inside the vehicle. The TOW equipment can be removed from the vehicle and set up on a standard ground mount in less than one minute, if required. When travelling, the launcher is rotated through 180° and lowered on to the top of the hull to reduce height and obscure its distinctive profile. The M901 has a crew of four and weighs 13 tons combat loaded.

XM981 Fire Support Team Vehicle (FIST)

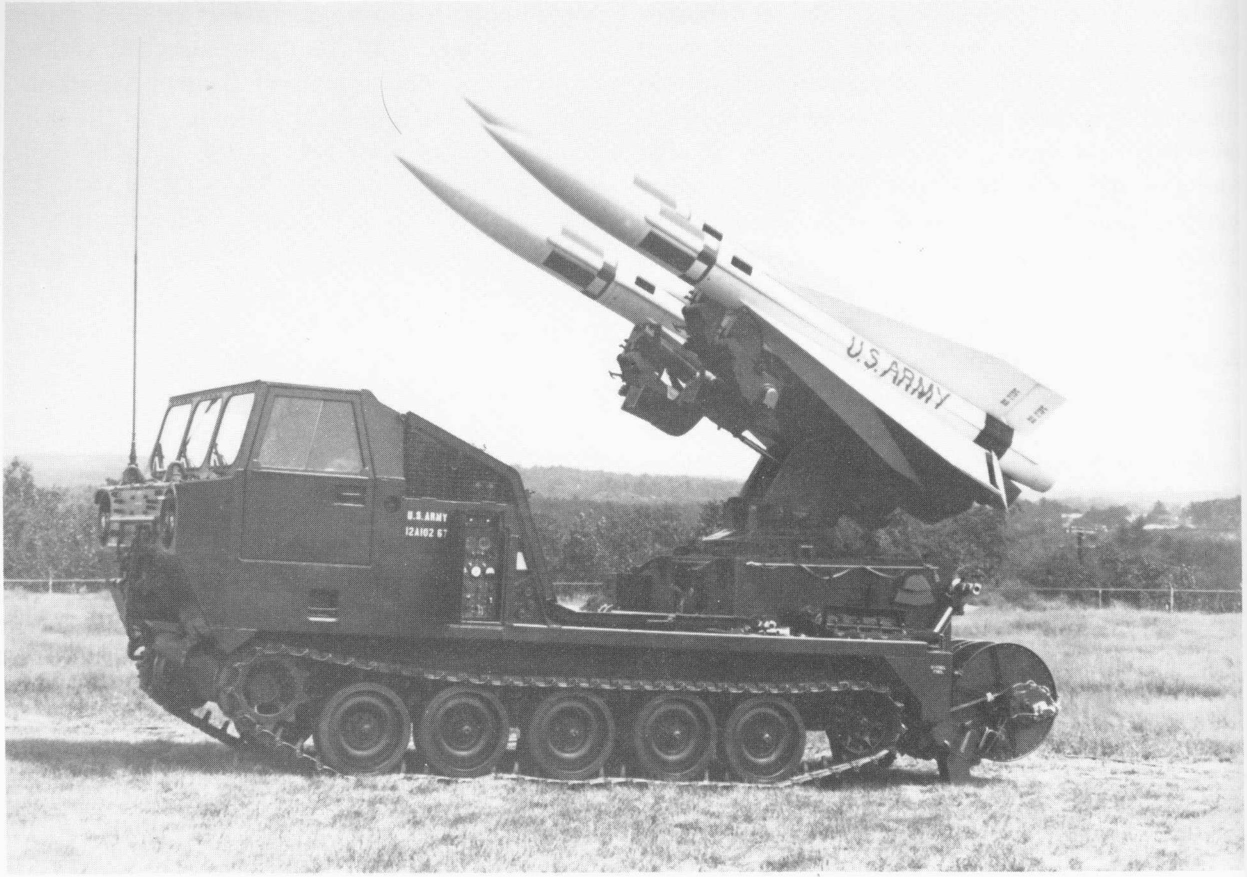
The XM981 is a forward observer's vehicle that will enter service with the US Army in the near future. Originally designated FOV for Forward Observer's Vehicle, the name has been changed to Fire Support Team Vehicle to avoid confusion with the acronym FOV, which applies to the M113 'Family of Vehicles' embracing the complete range of the M113 series. Based on the M113A2 APC, the XM981 is equipped for use by artillery forward observers in mechanised and armoured units. It is being developed by Emerson Electric Company and looks almost identical to the M901 ITV.

FIST uses a modified version of the TOW armoured launcher assembly, housing observation devices and a laser rangefinder locator-designator combination to illuminate targets for the Copperhead 155mm M712 Cannon-Launched Guided Projectile or other Precision Guided Munitions. The turret raises, lowers and rotates in the same manner as on the M901, and the only slight difference in appearance is the size and shape of the central opening in the pod face.

FIST is equipped with extensive communications equipment and a satellite-based position-locating system to fix positions with extreme accuracy. A digital message-entry device is being developed to eliminate the need for voice communications with artillery command posts and firing units. Also under development is a 50ft. telescopic extension incorporating at the masthead thermal-imaging, forward-looking infra-red (FLIR) sights, as well as daylight optics featuring low-light-level television. This facility will improve line-of-sight observation while allowing the vehicle to stay under cover and will double the area in view as compared to ground-level observation. Using the mast and daylight optics, targets can be



With missiles ready to fire on the M54 launch station, an M730 Chaparral Missile Carrier acts in the air defence role. The derivation of the M730 from the M548 Cargo Carrier is readily apparent. The aluminium hoops stowed at the front are ribs for a tarpaulin covering the rear bed and missile launcher in the travelling mode. (FMC Corporation)



HAWK missiles are elevated into firing position over the rear of an M727 HAWK Missile Carrier. Self-propelled HAWK did not prove as successful as the towed version and it has been phased out of service. (FMC Corporation)

laser-designated at five kilometres, while the night sight is effective to about two and a half kilometres, as well as being useful in bad weather or battlefield smoke.

AIFV—Armored Infantry Fighting Vehicle

In 1967, FMC was awarded a contract by the US Army to build two experimental carriers based on M113 components under the designation XM765, to fulfil the Army's requirement for a Mechanized Infantry Combat Vehicle incorporating a fully enclosed weapon system and firing ports for the infantry squad. Despite successful trials, the US Army did not adopt the XM765, but FMC continued to develop the design as a private venture, resulting in a new vehicle known as Product Improved M113A1 which appeared in 1970.

After extensive testing and further development involving a new 25mm gun turret, and the relocation of the commander's station from behind the 20mm gun cupola (as fitted on the PI M113A1) to a position alongside the new turret, a prototype was built in 1977 of a model called AIFV (Armored Infantry Fighting Vehicle). Funding for this development was supported by the Dutch Army, which placed an order for 800 vehicles in 1975 and received the first production AIFV in 1977. Subsequently the Army of the Philippines purchased the AIFV, and in July 1979 514 AIFVs were ordered by the Belgian Army.

The AIFV features a one-man enclosed weapon station mounting a 25mm Oerlikon KBA cannon and co-axial machine gun with day/night passive sights. The 25mm cannon is capable of defeating all light armoured vehicles at normal battle ranges, while its HE projectiles are highly effective against ground and aerial targets; 180 ready rounds are linked to the gun with an additional 147 in reserve.

Ten men including the driver, gunner and commander are carried by the AIFV, with six infantrymen facing outwards from the centre benches and a seat for a man to sit between the commander and the turret basket. There are two vision blocks and two firing ports in either side of the rear compartment for observation and for suppressive fire to be delivered in appropriate circumstances. A similar facility is available to the rear.

The AIFV embodies a considerable advance on the M113 in armour protection through the use of spaced laminate armour over critical areas of the welded aluminium hull and turret, while the upper hull sides and the hull front are sloped for superior ballistic protection. For increased safety, the crew are completely separated from the fuel tanks, which are mounted externally at the rear. Mobility is also improved over the M113 owing to the more powerful turbo-charged version of the Detroit Diesel 6V53 engine and the superior high strength torsion bar suspension.

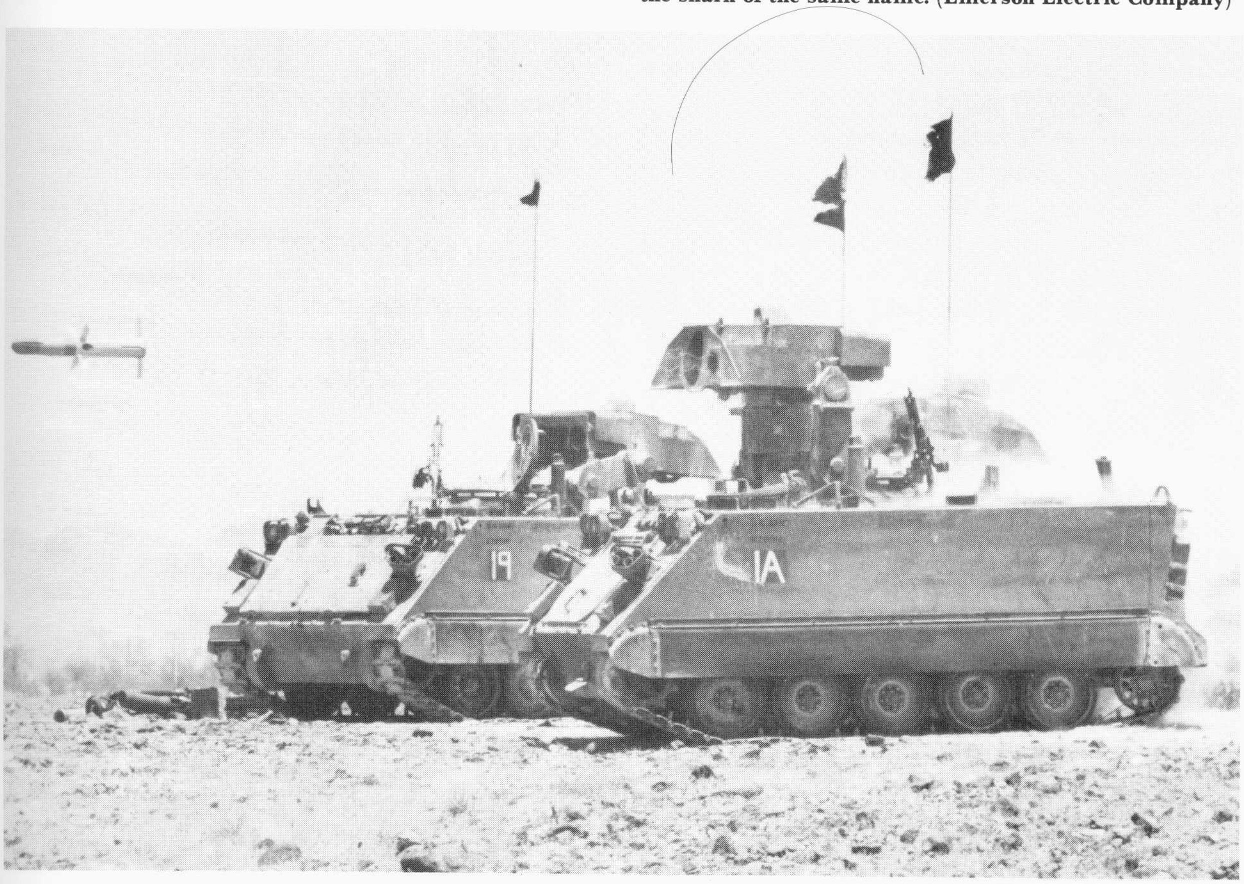
As with the M113, a family of vehicles is based on the AIFV including a command post version, mortar prime mover, TOW missile vehicle, cargo carrier and ambulance.

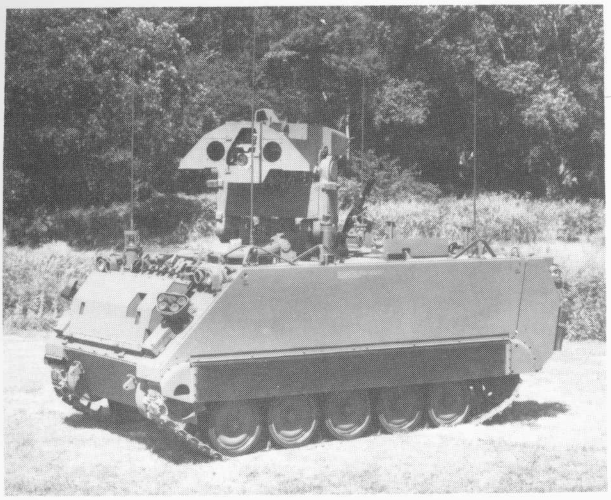
Tracked Rapier

Proven in combat during the Falklands conflict, the Rapier low-level guided weapon system is being procured by the British Army in a new configuration mounted on a tracked vehicle to provide air defence against low-level attack for the battlegroups of BAOR.

Tracked Rapier is based on a version of the M548, classified as RCM748, with the main alteration being the addition of an armoured cab to the front of the vehicle. To the rear of the cab is a blast shield which protects the forward part of the vehicle when a missile is fired. The Rapier launcher is mounted on the rear bed of the RCM748 and is armour-protected, as are the four-round missile bins to either side. The command aerial is mounted on an elevating mechanism which allows missiles to be fired and

An M901 Improved TOW Vehicle fires a TOW anti-tank missile from its elevating launcher assembly. The vehicles illustrated are based on M113A2 APCs, incorporating M239 smoke grenade launchers of British design. Note the launcher assemblies of the two M901s in the background are lowered on to their hull tops. The M901 is called by troops 'Hammerhead' because of the resemblance of the TOW launcher to the shark of the same name. (Emerson Electric Company)





The XM981 Fire Support Team Vehicle (FISTV) is equipped with extensive and sophisticated communications and electronics, and laser designator equipment for use by artillery forward observers. It is almost identical in appearance to the M901 ITV but has external fuel tanks at the rear to save internal stowage space. FISTV enters production in 1983. In operation, FISTV acquires a target, with its own position established in earth co-ordinates, and 'lases' the target. The range, azimuth and elevation are automatically sent to the Digital Message Device to be communicated to the Battery Fire Direction Center. The artillery battery then opens fire, hitting the target with a minimal probability of error. (Emerson Electric Company)

guided at low elevations over the cab.

An optical tracker is mounted in the roof of the cab through which the operator tracks the target, steering the system with a joystick control and thereby establishing an optical sight line to the target. Collimated with this optical system is a TV tracker, which measures the displacement of the missile from the sight line so that correcting commands can be transmitted to the missile; this is first used to gather, and subsequently to control the missile to fly along the sight line until impact.

The Rapier missile is identical to that used in the towed system. The missile is manufactured as a round of ammunition and requires no maintenance, testing or servicing. It has a range of over 6,500 metres and is effective from ultra low level to over 3,000 metres. Once the eight missiles have been fired, Tracked Rapier can be reloaded in under five minutes without recourse to a crane. Twenty replenishment missiles together with personnel and messing equipment for the Fire Unit are carried in a standard M548 Support Vehicle.

In order to allow operations at night and in poor weather conditions a Blindfire radar can be added to the Fire Unit, either towed in its wheeled form or mounted in the rear of an RCM748 vehicle.

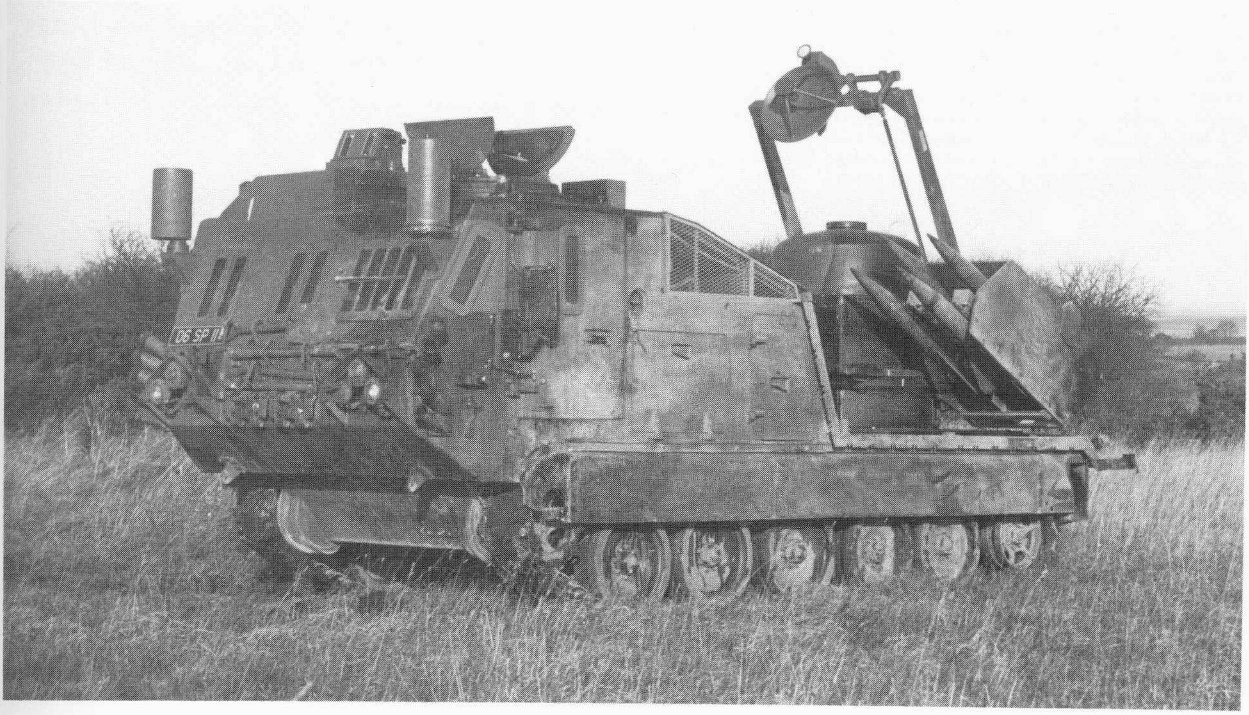
From a tactical move Tracked Rapier can be put into action and commence an engagement within 30 seconds of coming to a halt; the whole sequence is performed by the three-man crew from within the safety of the cab. Precise levelling of the vehicle and equipment is not necessary, and the crew only have to leave the cab to reload missiles. Fifty Tracked Rapier vehicles are on order for the British Army.

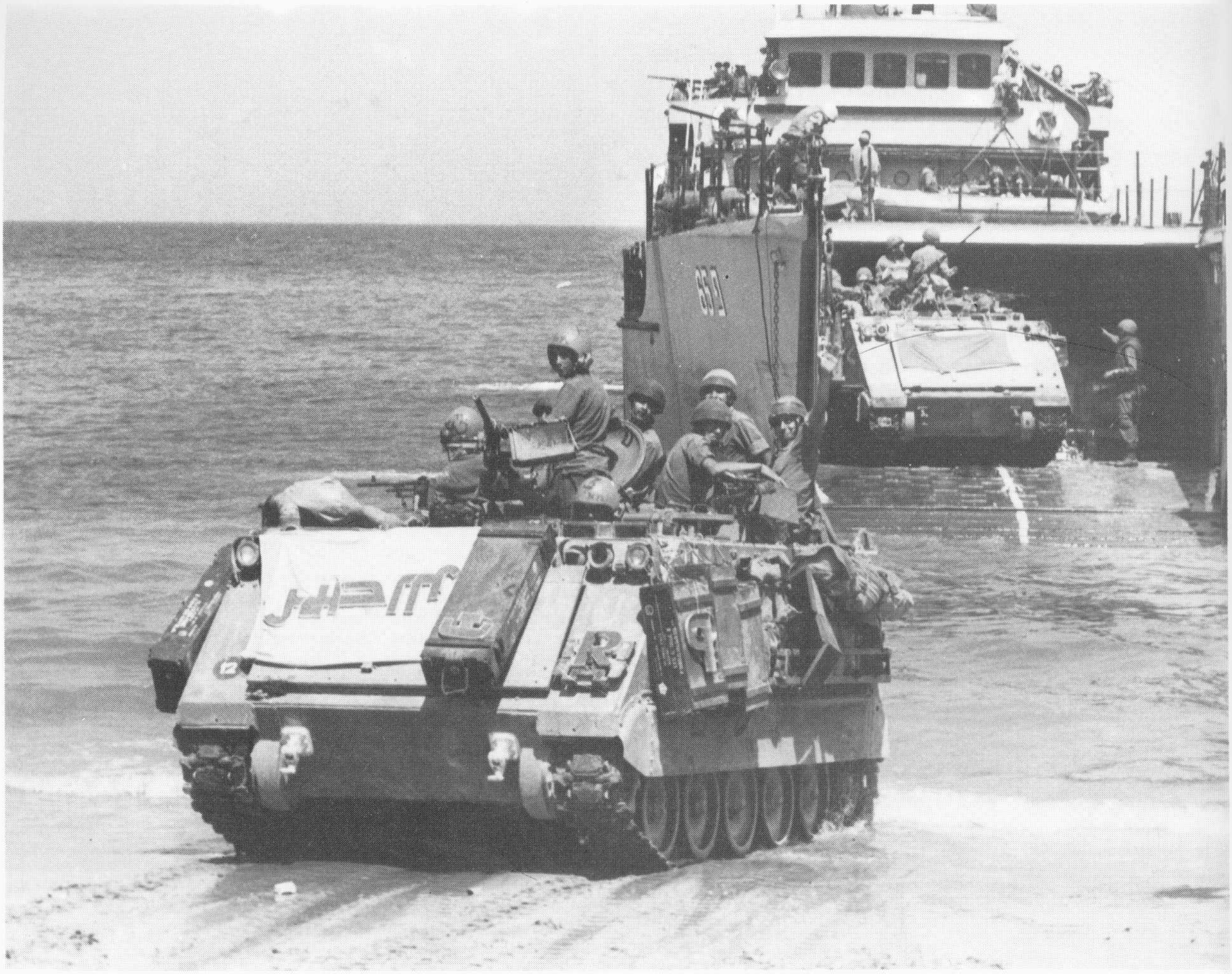
M113 Inventories

Argentina	140	— delivered 1967–69.
Australia	791	— includes 63 Fire Support Vehicles (15 FSV Saladin and 48 FSV Scorpion).
Belgium		— 525 M113A1 and 514 AIFV being built under licence in Belgium.
Bolivia	14	
Brazil	600	
Canada	800	
Chile	300	
Colombia	25	— delivered 1977.
Costa Rica		— small number in service.
Denmark	670	— includes 250 built by Oto Melara.
Ecuador	20	— delivered 1966.
Egypt	50	— delivered 1980. Approximately 850 of A2 series on order including M577A2, M548 and 38 M901.
El Salvador		— small number in service.
Ethiopia	28	— further deliveries embargoed.
Germany (FRG)	3,800	— all with diesel engines including 408 M106A1 with Tampella 120mm mortar, 100 M577A1,

		IFAB artillery forward observer vehicles and radar carriers for RATAC and Green Archer.
Greece	700	— further quantities on order.
Guatemala	10	
Haiti	12	
Iran	600	
Iraq		— small quantity in use captured from Iran.
Israel	6,500	— numerous detail changes for various roles.
Italy	3,500	— most built under licence by Oto Melara. Includes VCC-1 Camillino, a modified version of M113A1 similar in configuration to FMC's Product Improved M113A1.
Jordan	933	— includes M113A1/A2 and M163. 8 M901 and 50 other units on order.
Kampuchea		serviceability doubtful.
Korea (ROK)	200	
Kuwait		— 6 M548 delivered, about 200 M113A2 family on order.
Laos		— serviceability doubtful.
Lebanon	97	— includes 28 delivered 1980 with further 210 on order including 69 M113A2, 27 M125A2 and 8 M577A2.
Libya	100	— built by Oto-Melara.
Morocco	548	— includes 59 M163.
Netherlands	800	— does not include AIFV.
New Zealand	66	
Norway	120	— some with Hägglunds turret and Rh202 Rheinmetall 20mm cannon, vehicle designated NM135.
Pakistan	750	— further 100 on order.
Peru	300	
Philippines	49	— also AIFV on order.
Portugal	111	— further 9 M125A2 and

Tracked Rapier is based on an armoured version of the M548 known as the RCM 748. Between the four-round missile bins is the surveillance radar and IFF radome with the command aerial (above) in the elevated position. On the armoured cab roof is the optical/TV tracking system and at the forward corners the low-profile radio antennae. (RSA)





Israeli M113A1 APCs land on the coast of Lebanon during Operation 'Peace for Galilee'. These vehicles show the standard configuration of Israeli APCs, with a .50cal. M2HB at the commander's cupola and two FN 7.62mm MAG machine guns either side of the troop compartment. A Soltam 60mm Commando mortar is also fitted to the roof of Israeli M113 APCs to provide coverage over ranges from 100-800 metres. (IDF)

		18 M113A2/TOW on order.
Saudi Arabia	900	— further units on order.
Singapore	520	— further 185 M113A2 and 22 XM806E1 on order.
Somalia		— small number in service.
Spain	750	
Sudan		— 66 on order.
Switzerland	1,475	— M113 designated Schutzenpanzer 63, 500 APCs armed with 20mm gun turret of Swedish Pbv 302 APC, designated SPz 63/73. Further 160 M548 on order.
Taiwan	248	
Thailand	400	— 24 M163 on order.
Tunisia	96	— further 65 on order.
Turkey	2,000	— 129 purchased, 1,871 donated under MAP.
United Kingdom		— Lance and Tracked Rapier.
USA	24,000	— Approximately half are squad carriers.
Vietnam		— number unknown.
Uruguay	15	
Yemen (UAR)	50	— paid for by Saudi Arabia.
Zaire	54	

Note: many of the vehicles on order in the above list will have been delivered by now.

The Plates

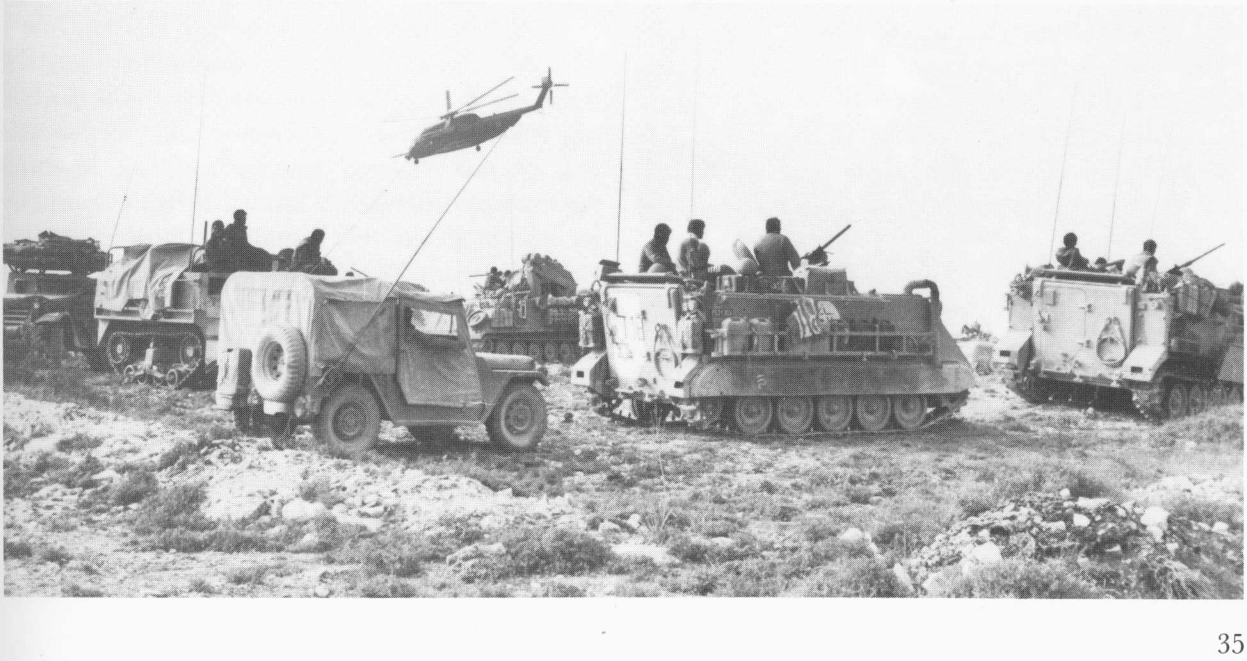
A1: M113 APC of 21st Mechanised Rifle Company, ARVN 21st Division; Mekong Delta, 1962

In the first months of operations in the Mekong Delta some ARVN M113 APCs were painted in this camouflage scheme. However, such schemes were short-lived and were never officially endorsed. Henceforth, with few exceptions, ARVN APCs were painted standard US Army Olive Drab, because it was deemed impossible to conceal an AFV which was either in motion or firing—in the words of the Senior American Armor Advisor to the ARVN Armor Command, 'Fifty tons of camouflage-painted pig iron looks like fifty tons of camouflage-painted pig iron.' This colour scheme was devised to enhance the psychological shock effect of the APCs, which at this time were dubbed 'Green Dragons'.

The insignia depict: (1) The shoulder patch of ARVN armour personnel, with the device in the circle at the upper left indicating the formation—the lightning bolt (illustrated) indicates Headquarters Armor Command. The Armor School had a three-flamed 'lamp of knowledge'. The regiments, both Cavalry and Tank, used the appropriate Arabic numerals, while the four armoured brigades used Roman numerals. (2) The branch insignia, either in metal or cloth (illustrated), was worn over the right breast pocket. US advisers were awarded this badge upon their counterpart's recommendation, and wear it to this day as a 'Combat Armor Badge'. (3) ARVN armour personnel wore a distinguishing black beret (worn pulled to the right, as opposed to all other arms which wore theirs to the left) adorned with a badge by which the basic grade level of the wearer could be determined. Enlisted men wore a simple silver tank; NCOs wore the tank enclosed in a silver circle; company grade officers had a gold circle (illustrated); and field grade officers wore a tank enclosed by a gold wreath. General officers wore the appropriate number of stars between the tips of the wreath.

A2: M113 APC of the Armor Regiment, ROK Capital Division; Qui Nhon, II Corps Tactical Zone, South Vietnam 1967

Reminiscent of the gaudy colour schemes adopted during the Korean War (cf. Vanguard 27 *Armour of the Korean War*), South Korean M113 APCs of the Republic of Korea Capital Division were painted in tiger stripes with a tiger's head on the



Vehicles from the Forward Company of an Ordnance battalion follow advancing IDF armour during Operation 'Peace for Galilee' in the Lebanon, June 1982. Experiences in the October War of 1973 revealed the vital necessity of rapid repair and recovery for armoured units in order to maintain offensive capabilities. Accordingly, forward elements of Israeli Ordnance Corps personnel are now fully mobile, employing a variety of specialized vehicles including the venerable M3 half-track and the M113A1 Fitter's Vehicle – seen below the Super Frelon beyond the M113A1 Armoured Ambulance, marked with red Stars of David, of a medical unit. (IDF)

Légionnaires of the French Foreign Legion's 2ᵉ REP watch warily as Israeli troops evacuate the port area of Beirut, September 1982. The rear doors of Israeli APCs are painted white as a mutual recognition device. (Légion Etrangère)

trim vane, reflecting the formation's sobriquet – 'the Tigers'. The inscription on the hull front is Korean for 'tiger'.

B1: M113A1 APC of the Reconnaissance Platoon, Headquarters and Headquarters Company, 4th Battalion, 23rd Infantry (Mechanized) of 25th Infantry Division: Trang Bang, South Vietnam, 1968

Mounting ACAV hatch armour and gunshield for the .50cal. Browning, this M113A1 APC of 4/23rd (Mech) is adorned with a pig's head and is named THE UGLY AMERICAN, after the book by William Lederer and Eugene Burdick which was highly critical of America's involvement in South-East Asia. All vehicle markings are painted in white but are tainted with red dust, characteristic of the rubber-growing areas of Vietnam.

B2: M577A1 Armored Command Post of Headquarters and Headquarters Troop, 1st Squadron, 4th Cavalry of 1st Infantry Division; III Corps Tactical Zone, South Vietnam, 1968

US AFVs rarely carried camouflage schemes during the Vietnam War, as they served little purpose in the circumstances and against the enemy encountered. This M577A1 of the 'Quarterhorse' sports dark green stripes over the Olive Drab base colour, as well as a drawing on the hull side of the cartoon character 'Road Runner', after whom was named one of the standard missions conducted by armour units in Vietnam. On the roof of the M577A1 are two armoured helicopter pilot's seats salvaged from damaged 'choppers'.

C1: M106A1 4.2in. Mortar Carrier of Troop I, 3rd Squadron, 11th Armored Cavalry Regiment; III Corps Tactical Zone, South Vietnam, 1969

In Vietnam the Support Squads of Armored Cavalry Platoons in both divisional and regimental Armored Cavalry Squadrons were equipped with the M106 4.2in. Mortar Carrier. However, as the minimum effective range of the M30 mortar was greater than the distance of the majority of firefights, and it was therefore unable to bring fire to bear in many contacts, M106s were commonly grouped at troop or squadron level to give area coverage. This 'four-deuce' tows a 1½-ton M332 ammunition trailer carrying additional mortar rounds for extended firing. The bumper numbers '11ACR' 'I-29' denote 2nd Armored Cavalry Platoon of Troop I, 3rd Squadron, 11th Armored Cavalry Regiment, while '9' was the number of the support squad vehicle. The detail view shows the stencilled inscription on the commander's cupola hatch, which adorned many AFVs of the 'Blackhorse Regiment'. Its sentiments are self-evident.

C2: M548 Cargo Carrier of 168th Engineer Battalion, 79th Engineer Group; III Corps Tactical Zone, South Vietnam, 1969

The M548 Cargo Carrier was widely used in Vietnam to support armoured and mechanised units across forbiding terrain that defied the passage of wheeled supply vehicles. MOTHER TRUCKER served with a Land Clearing Company of 168th Engineer Battalion, 79th Engineer Group of 20th Engineer Brigade within II Field Force in III CTZ.

D1: M113A1 APC of 3 Troop, B Squadron, 3rd Cavalry Regiment, RAAC; Phuoc Tuy Province, South Vietnam, 1970

Australian APCs in Vietnam were progressively fitted with machine gun cupolas during the war to provide greater protection to vehicle commanders, the type illustrated being the Cadillac-Gage T-50 on an M113A1 APC. The vehicle callsign '31A' was displayed on the rear ramp and on the vehicle sides on detachable metal plates, with '31' and 'Alpha' either side of the B Squadron sign of a red square: '31A' denotes the second vehicle of 1st Section, 3 Troop. The insignia of IATF and the registration number '134288' is borne on the rear bumpers. The vehicle is named & TEARS after the rock group Blood, Sweat and Tears; the other two vehicles of 1st Section being BLOOD and SWEAT. Other sections named their APCs in a similar manner, such as THE GOOD, THE BAD and THE UGLY after the Clint Eastwood 'Spaghetti Western' film. Vehicle names ranged from the humorous to the bizarre, e.g. CAR FIFTY FOUR after the TV comedy series 'Car 54 Where Are You?' reflecting the problems of navigation in jungle terrain; rather less subtle is GOOKCRUSHER. Many vehicles sported maps of Australia with the state from which crew members originated painted in a different colour. Another common marking on the APCs of 3rd Cavalry was a scorpion. This was an unofficial insignia adopted by the cavalry on account of the prowess of the unit's pet scorpion in defeating all comers in duels to the death. The detail view shows the unofficial, locally-fabricated shoulder patch of 3 Troop.

D2: M113A1(FS) Fire Support Vehicle of the Support Troop, A Squadron, 3rd Cavalry Regiment; FSB Horseshoe, Phuoc Tuy Province, South Vietnam, 1971

Six M113A1(FS) Fire Support Vehicles served in Vietnam from early 1971 until the departure of 3rd Cavalry in March 1972. Two served in a Cavalry Troop and the others in two sections in a Support Troop. Finished in Australian Olive Green, THE BEAST carries its registration number '134712' front and rear. The callsign number '42A' is painted on both hull sides within the blue triangle of A Squadron, and is repeated on the rear door together with the insignia of 1st Australian Task Force—a red leaping kangaroo on a yellow shield. The yellow Xs on the barrel are a reminder of that excellent Queensland beer '4X'. The FSVs undertook many tasks, but were mainly employed for indirect fire from Fire Support Bases and for protection of Land Clearing Teams.

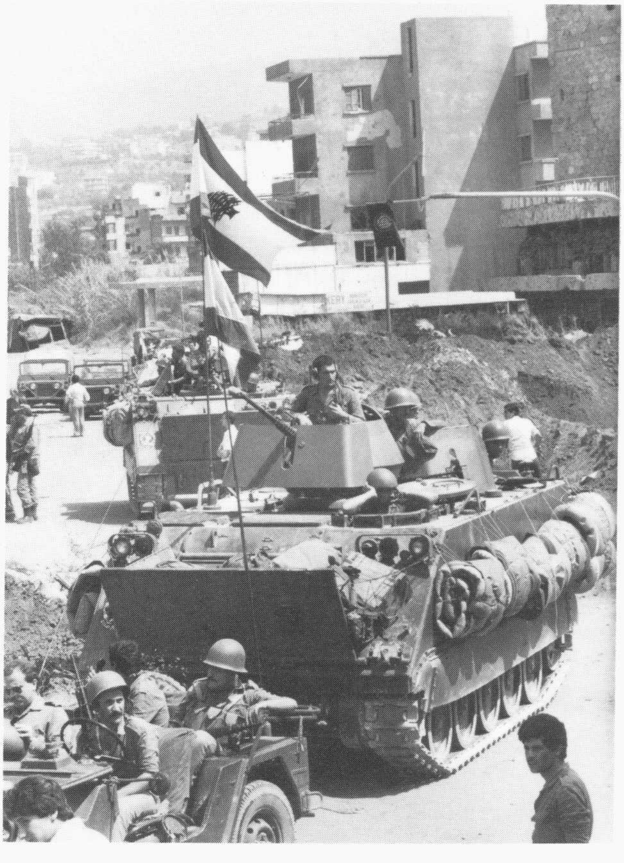
E: ACAVs in Vietnam

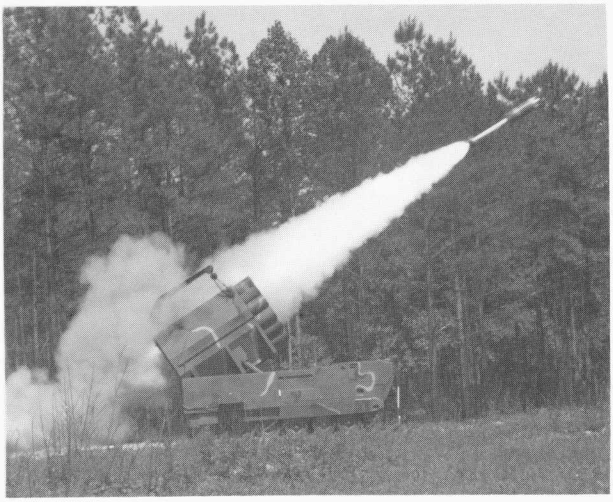
The majority of AFVs during the Vietnam War were innocent of graffiti, and even official markings were either obliterated or subdued; for reasons of survival, most crews did not wish to draw attention to their particular vehicle—conspicuous markings formed convenient aiming points for enemy RPGs. Some crews, however, were less prudent, and their vehicles displayed a gamut of extravagant designs.

E1: ACAV of Troop B, 3rd Squadron, 4th Cavalry, 1969

EL TORRO ('The Bull') carries on the gunshield a stylised regimental insignia with the squadron number above and with the vehicle callsign number to its side—'24', indicating the fourth vehicle of 2nd Platoon and the second vehicle of the second Scout Section. The sequence was: '20'—ACAV of platoon leader; '21' and '22'—ACAVs of first Scout Section; '23' and '24'—

Flying national flags, M113A2 ACAVs of the Lebanese Army move into West Beirut to relieve the French peace-keeping force, September 1982. (Légion Etrangère)





One of several new variants derived from the M113 currently entering service with the US Army is the Surface Launched Unit, Fuel Air Explosive (SLUFAE) Mine Neutralization System, which fires unguided rockets to disrupt enemy minefields by blast overpressure. (US Army)

ACAVs of second Scout Section; '25', '26' and '27'—Sheridans; '28'—infantry squad APC; and '29'—M106A1 'mortar track' of the Support Squad. The white triangle at hull rear is a troop colour code whereby the troop commander could identify his units at a glance: Troop A, red; Troop B, white; and Troop C, blue. The push-buttons of his radio were similarly colour-coded.

E2: ACAV of Troop E, 2nd Squadron, 11th Armored Cavalry Regiment, 1969

Prominently exhibited on the hull sides of this ACAV are the crossed sabres, symbol of the Cavalry Branch, and often painted on the AFVs and helicopters of cavalry units. The numbers '2' and '11' above and below the sabres denote 2nd Squadron, 11th Armored Cavalry Regiment. Above is the name CLOUD 9 as well as CATHY GIRL, a crewman's reminder of his girlfriend 'back in the World'. On the gunshield is EVIL 26, indicating the sixth vehicle of 2nd Armored Cavalry Platoon of Troop E, who adopted the callsign 'Evil' in preference to the official phonetic alphabet word 'Echo'; Troop K ('Kilo') called themselves 'Killer' Troop.

E3: ACAV of Troop A, 1st Squadron, 10th Cavalry, 1971

On the hullside WHY ME sports the cartoon character Snoopy firing a .50cal. Browning, and a red-over-white cavalry guidon abaft the vehicle number. In 1/10th Cav the vehicle callsign numbers were colour-coded red, white and blue to indicate A, B and C Troops. WHY ME carries a plethora of names on its gunshields and hatch armour, OMERTÀ being the Mafia code of silence.

F1: M113A1 Carrier (Cavalry Scout Version) of 2nd Armored Cavalry Platoon, Troop B, 1st Squadron, 11th Armored Cavalry Regiment; Outpost Alpha, Fulda Gap, Germany, 1981

US Army Cavalry units are currently equipped with the M113 pending the introduction of the M3 Cavalry Fighting Vehicle. The M113A1 Cavalry Scout Version differs from the basic APC only in the combat loading. It has a crew of five—driver, commander/gunner, two observers with M203 'over and unders', and the fifth member manning the squad M60 MG. The Armored Cavalry Platoon comprises ten vehicles—'B-20' M113A1 (CSV) of the platoon commander; 'B-21' to 'B-24', M60A3 tanks; 'B-25' and 'B-26', M113A1 (CSV) with Dragon; 'B-27' and 'B-28', M901 Cavalry TOW Vehicles; 'B-29', M106A1 Mortar Carrier.

BULL RIDER is painted in the MERDC camouflage but the colours do not conform to an official scheme—not unusual in 7th Army. The vehicle mounts an FGM-77 Dragon ATGW (M175) beside the M2HB Browning to augment firepower and tank-killing capability; in this guise the vehicle is nicknamed 'Dragon Wagon' or 'Dragon Track'. The shield to the front of the weapon is simply a brush guard and provides no armour protection. The device on the hull front is a CBR detector. The bumper numbers are in subdued flat black, with from left to right: a Roman numeral 'V' denoting 5th Corps; 'I/II CAV', 1st Squadron, 11th Armored Cavalry Regiment; and 'B-25', the fifth vehicle of 2nd Platoon, Troop B.

F2: M577A1 Command Post Vehicle of Battery Battalion, Artillery, West Germany, 1978

In 1973 the US Army introduced a series of four-colour camouflage schemes devised by the Mobility Equipment Research and Development Command (MERDC) at Ford Belvoir, Virginia. During the acceptance trials, US 7th Army in

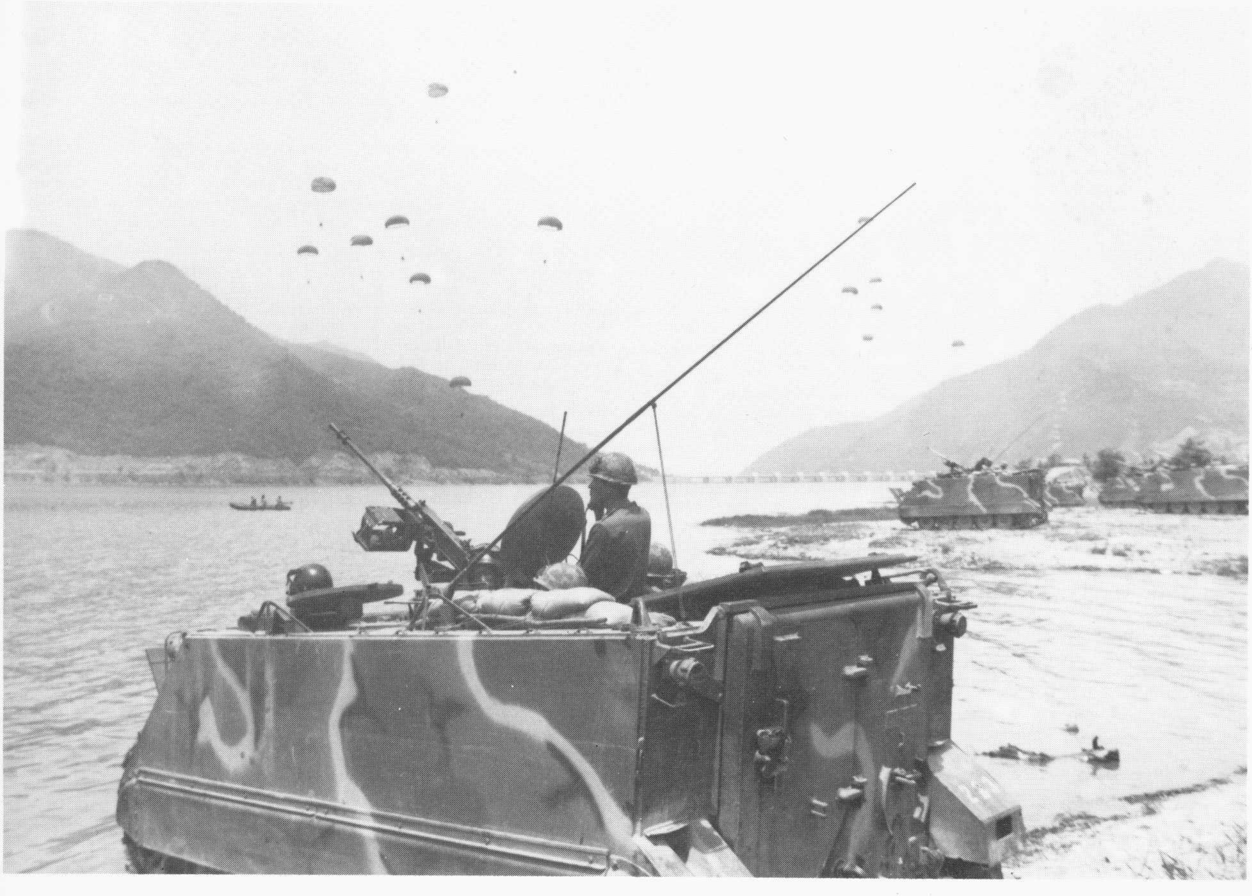
Europe created temporary patterns pending introduction of the formal MERDC schemes. While the latter uses two principal and two secondary colours, the 7th Army has three and one—Sand, Earth Red, Olive Drab and Black—as on this M577A1 named BUZZARD BRAINS. Although officially superseded by MERDC, many vehicles in Germany still retain these 'temporary' schemes.

G1: M113A2 APC of 8th Infantry Regiment, Royal Moroccan Army; Operation 'Ohoud', Western Sahara, 1979

The M113 is in service with over 50 armies around the world and has seen combat in virtually every conflict since the early 1960s. Operation 'Ohoud' was a large-scale offensive conducted by a force comprising 1,500 vehicles and 6,000 men of the Moroccan Army against the Polisario guerilla movement in the Sahara desert. Moroccan AFVs include French VAB APCs, Soviet 'Stalin Organ' rocket launchers (purchased from Rumania), Austrian Kürassier K tank destroyers (known as Iska in Moroccan service), and American M163 Vulcan air defence vehicles and M113A1/A2 APCs. The vehicles are painted overall desert sand, and the M113s feature the vehicle numbers in Arabic script prominently along the hull sides. The two white stripes on the trim vane are a recognition sign carried by all vehicles.

G2: M113A1 'Zelda' of the Israeli Defence Forces; Operation 'Peace for Galilee', Lebanon, 1982

The Israeli Defence Forces are the largest user of the M113 after the US Army, with over 6,000 in service. It is known as 'Zelda', which is a girl's name in Hebrew. The Zelda was extensively employed in numerous roles during Operation 'Peace for Galilee'. Israeli doctrine does not require that infantry fight mounted from APCs and, for the moment, sees no need for expensive mechanised infantry combat vehicles. The M113 is therefore



South Korean M113 APCs support a paratroop drop during manoeuvres near the Demilitarized Zone along the 38th Parallel. The vehicles are finished in the US MERDC temperate zone camouflage scheme. (ROK Army)

admirably suited to their concept of a combined-arms formation in which the APC transports infantry to the start-line for dismounted assault which tanks, the main component of armoured formations, cannot perform. The Israelis have made a number of detail changes to their M113 family of vehicles, such as the extension of the exhaust pipe down the hull side. The most significant operationally is the installation of external fuel tanks at the rear (as on the vehicle illustrated), both on new order vehicles and as a retrofit programme. During the October War the location of the fuel tank on the inside rear left-hand hull wall proved vulnerable on occasions, leading to catastrophic internal fires. The vehicle illustrated is finished in the sand grey colour characteristic of vehicles on the Northern Front. The significance of the markings remains a matter of conjecture and unit identification is not known. The cerise panel is an air recognition sign.

H: M113A1 Interior, and Combat Loading Plan of M113A1 (Cavalry Scout Version)

This plate illustrates the interior of a typical M113A1 APC. The inside is painted Sea Foam Green because this colour is supposed to be psychologically the most restful in confined spaces. Besides the clutter of crew kitbags, ammunition boxes, combat rations, Dragon rocket launcher and other paraphernalia, two essential items carried by all APCs on operations are a beer cooler, and a map of the local area attached to the fuel tank.

Notes sur les planches en couleur

A1 Ancienne combinaison de peinture de camouflage, bientôt remplacée par du vert olive ordinarie. Les détails de l'insigne sont: (1) écusson de ARVN Armour Command HQ (2) insigne pectoral de droite des tankistes (3) badge d'officier subalterne, unités blindées ARVN, porté sur béret noir. **A2** Ce thème qui rappelle le camouflage criard utilisé au cours de la guerre de Corée compte l'insigne relatif au surnom de la division: 'Les tigres'.

B1 Le nom fait écho au titre du célèbre ouvrage qui critiqua le rôle des Etats-Unis dans le Sud-est asiatique: 'The Ugly American' (l'affreux américain). **B2** Les véhicules militaires américians étaient rarement camouflés mais celui-ci arbore des raies vertes. Remarquez le personnage de dessin animé 'Road Runner' et les sièges blindés fixés au toit du pilote d'hélicoptère 'libéré'.

C1 Les inscriptions indiquent le llème régiment de cavalerie blindée; neuvième véhicule, troupe I, section 2. Notez la remorque à munitions M332 avec ses projectiles de mortier supplémentaires. **C2** Le véhicule de charge M548 a été utilisé intensivement au Vietnam pour appuyer des unités mécanisées sur des terrains défiant le passage des véhicules à roues.

D1 Les véhicules blindés australiens étaient équipés de diverses tourelles: voici le Cadillac-Gage T50. '31A' est la désignation du deuxième véhicule, lère section, 3ème troupe et le carré rouge identifie l'escadron B. L'insigne au kangourou de la '1st Australian Task Force' est exhibé avec d'autres emblèmes officieux. Ce nom rappelle que les trois véhicules de cette section ont été baptisés d'après un groupe de rock: 'Blood', 'Sweat', 'and Tears'. **D2** Six véhicules équipés de la tourelle du blindé Saladin ont servi au Vietnam. Le triangle bleu identifie l'escadron A; et le kangourou rouge, 1ATF.

E1 Sabres de cavalerie dont le symbole '2' correspond à l'escadron 2, '11' = 11ACR. Plusieurs noms différents ont été peints par l'équipage, y compris l'indicatif semi-officiel 'Evil 26'—'E' pour 'Troupe E'. **E2** Insigne stylisé du régiment ainsi que le numéro de l'escadron '3' et l'indicatif du véhicule '24' peint sur le bouclier du canon d'un véhicule baptisé 'The Bull' (le taureau). Le triangle à l'arrière de la coque identifie la troupe: 'Troupe A', rouge; 'Troupe B', blanc; 'Troupe C', bleu. **E3** De nombreux noms et slogans couvrent un véhicule décoré du personnage de bandes dessinées 'Snoopy'. Dans cette unité, la séquence de couleur a été appliquée aux numéros d'indicatifs du véhicule.

F1 Malgré l'introduction à cette époque du camouflage officiel quadricolore pour l'armée américaine, de nombreuses unités en Allemagne continuaient à utiliser leur propre version non-officielle dont certaines persistent encore à l'heure actuelle. **F2** Motif de camouflage officiel MERDC, mais les couleurs sont officieuses. Les inscriptions sont: 'V' (V Corps), 'I/II CAV' (ler escadron, llème régiment de cavalerie blindée), 'B-25' (Troupe B, 2ème section, cinquième véhicule).

G1 Numéro particulier de véhicule en caractères arabes sur les côtés de la coque; les raies blanches sont un signe de reconnaissance arboré par tous les véhicules pour cette opération. **G2** Les modifications apportées par les Israéliens sont notamment des réservoirs de carburant à l'extérieur de la coque arrière et le prolongement sur le tuyau d'échappement. L'importance de ces inscriptions n'est pas connue.

H Pour des raisons d'espace, il serait bon que les lecteurs se reportent aux légendes en langue anglaise.

Farbtafeln

A1 Frühe Tarnfarben, bald darauf durch einfaches Olivgrün ersetzt. Abzeichen: (1) Schulterabzeichen des ARVN Armour Command HQ; (2) rechtes Brustabzeichen des bewaffneten Personals; (3) Abzeichen der jüngeren Offiziere der bewaffneten ARVN-Einheiten, auf dem schwarzen Barrett getragen. **A2** In Erinnerung an die lebhaften Tarnfarben, die im Korea-Krieg benutzt wurden, deutet das Abzeichen auf den Spitznamen der Abteilung an—'Die Tiger'.

B1 Der Name erinnert an das berühmte Buch, das die Rolle der USA in Südostasien kritisch untersucht: 'Der hässliche Amerikaner'. **B2** US-Fahrzeuge waren selten getarnt, aber dieses hier trägt grüne Streifen. Man beachte die Zeichen-trickfilm-Figur 'Roadrunner' und die auf dem Dach befestigten 'geklauten' Hubschrauber-Pilotensitze.

C1 Die Markierungen verweisen auf das II. Gepanzerte Kavallerie-Regiment, Truppe I, 2. Zug, neuntes Fahrzeug. Man beachte die M332 Munitionsanhänger mit zusätzlichen Granaten. **C2** Das M548 Kargo-Fahrzeug wurde in Vietnam vielfach eingesetzt, um mechanisierte Einheiten in Gebieten zu unterstützen, wo Fahrzeuge mit Rädern nicht zu benutzen waren.

D1 Australische Fahrzeuge waren mit verschiedenen Geschütztürmen ausgestattet, hier ein Cadillac-Gage T50. '31A' steht für zweites Fahrzeug, 1. Abteilung, 3. Truppe, und das rote Viereck verweist auf Schwadron B. Neben dem Känguruh-Abzeichen der 1. Australian Task Force (1ATF) noch andere inoffizielle Embleme. Die Namen der drei Fahrzeuge wurden von der Rockgruppe 'Blood, Sweat, & Tears' übernommen. **D2** Sechs Fahrzeuge mit dem Geschützturm des Panzerwagens 'Saladin' wurden in Vietnam eingesetzt. Das blaue Dreieck steht für Schwadron A, das rote Känguruh für 1ATF.

E1 Kavallerie-Säbel; '2' = Schwadron 2, '11' = 11ACR. Verschiedene Namen wurden von den Soldaten aufgemalt, darunter das halboffizielle Rufzeichen 'Evil 26'—'E' steht für Truppe E. **E2** Stilisierte Regimentszeichen, zusammen mit der Schwadron-Nummer '3' und dem Fahrzeug-Rufzeichen '24' auf den Kugelschild eines Fahrzeugs mit dem Namen 'Der Bulle' gemalt. Das Dreieck auf der Hinterseite der Karosserie verweist auf die Truppe—Truppe A: rot, Truppe B: weiss, Truppe C: blau. **E3** Viele Namen und Slogans auf einem mit einem 'Snoopy'-Bild dekorierten Fahrzeug. In dieser Einheit wurden die Farben für Fahrzeug-Rufzeichennummern benutzt.

F1 Während zu dieser Zeit die offizielle Vierfarben-Tarnung der US Armee eingeführt wurde, benutzten viele Einheiten in Deutschland ihre eigenen, inoffiziellen Versionen, von denen einige noch heute existieren. **F2** Offizielle MERDC-Tarnung mit inoffiziellen Farben. Markierungen: 'V' (Korps V), 'I/II CAV' (I. Schwadron, II. Gepanzertes Kavallerie-Regiment), 'B-25' (Truppe B, 2. Zug, fünftes Fahrzeug).

G1 Individuelle Fahrzeugnummer in arabischen Ziffern auf den Karosserieseiten; weisse Streifen sind das bei dieser Operation von allen Fahrzeugen getragene Erkennungszeichen. **G2** Israelische Änderungen waren u.a. das Anbringen der Benzintanks an der Aussenseite der hinteren Karosserie und eine Verlängerung des Auspuffs. Die Bedeutung der Markierungen ist unbekannt.

H Aus Platzgründen wird der Leser auf die englischen Bildunterschriften verwiesen.

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